



THE GEOLOGICAL SOCIETY OF MINNESOTA

News

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

From the President's Desk...

I write this in mid-April after attending Eric Nowariak's lecture "Important Events in Precambrian Earth History As Seen Through Minnesota's Bedrock." A strong lecture, as were all that Program Director Steve Erickson arranged for this lecture season. We have had a surprising number of reschedules and cancellations this winter/spring, but we can be flexible when necessary. Steve is currently working on the schedule for this fall. If you have any suggestions, please reach out to Steve. As in the past, a few of the lectures during the colder times will be remote over Zoom, so don't limit your suggestions to local presenters.

One of the reschedules was intentional: Eric accommodated us by shifting his talk from April 8 so that many of us could see this year's total solar eclipse. A show of hands at Eric's lecture indicated that well over a dozen of us did travel to see this remarkable phenomenon. I understand that for those of you in Minnesota the partial eclipse was masked by heavy clouds. Many GSM members went to southern Missouri and had a great experience. I travelled with family to Terre Haute, IN. I'm glad to report that despite heavy rain the previous evening, skies cleared overnight so we saw totality in all its glory.

I will miss the last two lectures, including the Spring Banquet, as I will be traveling in Spain during that time. Part of my travels are a Rick Steves tour of Andalusia and part will be renting a car and traveling on my own, including daytrips to Gibraltar and across the Strait to Tangier, Morocco. My decision to see this part of the world was inspired by our lecture in November 2022 "Southern Spain: Tectonic Collision, Geoparks, and Fabulous Vacation Spots" by Melissa Lamb of the U of St. Thomas. I corresponded with Melissa and looked forward to seeing sites she suggested. This was a trip I planned to take a year earlier, but was delayed due to a leg injury that occurred in February 2023. I expect that Kate Clover will coax a Newsletter article from me for a later edition.

We hope to offer a few field trips this year, but nothing solid has yet been planned. As GSM field trip coordinators, Joe Newberg and I are always looking for field trip suggestions. Local trips might involve a single day or just a few hours, while those farther away might span a weekend or up to a full week. Let us know where you would like us to visit.

The State Fair is still months away, but Patrick Pfundstein is already actively planning for the Great Minnesota Get Together. When we send out requests for volunteers, please consider signing up for a shift. The Fair is one of the primary ways that GSM reaches out and educates the public, as well as a way that we have attracted many new members. And it is fun!

As always, Kate Clover, Mark Ryan, Harvey Thorleifson, and Rich Lively are to be commended for their great job of editing the GSM News. But editors need content; this publication is by GSM members for GSM members, and it is a permanent record for our society. (I always enjoy the Notes from the Past.) Consider submitting an article to the editors about something you read, a place you visited, a geological experience from your



GSM President,
David Wilhelm

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GSM Field Trip to Kasota, Minnesota, 1941. Led by Dr. Stauffer, examining glacial erratics.



childhood, or whatever you think might interest your fellow enthusiasts. And thanks to all who have contributed articles to this edition.

Enjoy a beautiful summer outdoors in Minnesota and wherever your travels take you.

David Wilhelm

GSM

2024 Board of Directors:

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- Deborah Naffziger, Vice President
- Dave Kelso, Secretary
- Steve Willging, Treasurer

Board Members: Roger Benepe; Dick Bottenberg; Kate Clover; Pete Hesse; Lowell Hill

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Programs/Lectures/Labs: Steve Erickson

State Fair: Patrick Pfundstein

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Webmaster: Alan Smith

Web Site: gsmn.org

The Geological Society of Minnesota is a 501(c)3 nonprofit organization.

GSM Mail Address: Send all GSM membership dues, change of address cards, and renewals to: Joanie Furlong, GSM Membership Chair, P.O. Box 141065, Minneapolis, MN 55414-6065

Membership categories and dues:

Student (full time)	\$10
Individual	\$20
Family	\$30
Sustaining	\$50
Supporting	\$100
Guarantor	\$250

Individual and Family memberships can be renewed for 1, 2, or 3 years. Members donating at the Sustaining, Supporting or Guarantor levels will have their names highlighted in the GSM membership directory.

GSM News: The purpose of this newsletter is to inform members and friends of activities of interest to the Geological Society of Minnesota. GSM News is published four times a year during the months of February, May, August and November.

Newsletter contributions welcome:

GSM enthusiasts: Have you seen interesting geology while traveling? If so, please consider sharing your experiences with others through our GSM Newsletter. Write a short article, add a photo or two and send it in. Deadline for submission is the first of the month before the publication date. Send your story to newsletter editor: Kate Clover, kclover@fastmail.fm Thank you in advance.

GSM Board Membership:

The GSM Board consists of members who have a special interest in advancing the goals of the society, including lectures, field trips, and community outreach. The Board currently has ten members, and our bylaws limit terms to four years to encourage turnover, and a change of perspectives and ideas.

The Board meets quarterly, on the second Thursdays of February, May, August, and November, or on a different date if conflicts arise. In-person and Zoom meetings are from 7 - 9 pm. Meeting location will be announced close to the meeting date. Board meetings are open to all GSM members. If you are a new or long-time member and Board membership is of interest to you, please consider attending a meeting. If you have a topic you would like the Board to consider, please contact David Wilhelm, dewilhelm53@msn.com

Welcome New Members!

- Wilson Schafer, Edina
- Melinda Edstrom, Cannon Falls
- Margaret Kirkpatrick, Minneapolis
- Lynn Rogers, Ely

Connections with Sister Organizations

Dave Wilhelm
 Beside my newly reacquired role as GSM President, I am also the GSM Liaison Officer. In this role, I send you many e-mails of items that might generally interest you. I hope you find them useful. Many of these ideas come from you; please continue sending them.

But I also correspond with other

organizations with like-minded goals. This correspondence started in earnest in 2020 with the COVID-19 pandemic, when many (most) organizations moved to remote presentations, making their remote lectures available to our members, and ours to them. (I send them notices of our online lectures.) What follows is a list of these organizations.

We regularly receive webinar invitations from Doug Hallum, President of the Nebraska Geological Society (<https://www.nebraskageologicalsociety.org/>), which I pass on to our members. When I attend these remote sessions, I see names from GSM that I recognize, so I know many of you are taking advantage of these opportunities. Our relationship with Doug goes further back, however; he was one of the very helpful local geologists, along with Jeremy Dillon and Paul Hanson, who led us through central Nebraska on the GSM field trip associated with the August 2017 total solar eclipse. Doug also informs us of webinars hosted by the Kansas Geological Society (<https://www.kgslibrary.com/>), a group composed primarily of geological professionals. I forward these notices to you, but have not yet established a direct connection with KGS.

Another organization whose webinars many of you attend is the Rochester Academy of Science (<https://rasny.org/>) in New York. This organization has multiple sections. The two most closely aligned to us are the Mineral Section (contact Jutta Dudley) and the Fossil Section (contact Michael Grenier). Once again, I see names of many GSMers when I attend these.

Although not a geological organization, we have an even longer relationship with the Minnesota Astronomical Society (<https://www.mnastro.org/>). My friend (and fellow Illini alum & Alaska traveler) Suresh Sreenivasan heads their Beginner Special Interest Group (BSIG), and he sends me notices of all their events, which I forward to you. Some of these are webinars (winter) and others are observing events (summer). In June 2016, MAS treated GSM members to a special treat: an evening at their Eagle Lake Observatory in Carver County Baylor Regional Park in rural Norwood-Young America. We enjoyed an excellent lecture on Martian rovers from a NASA ambassador and a great night of observing through many of the first-class telescopes on site.

In Memoriam: Wally Bratt



Walter Edward 'Wally' Bratt, lover of rocks, history, and politics, died January 17, 2024 in Amery, WI.

Born on August 13, 1929, Wally was the son of Rose and Walter Bratt, hailing from South Minneapolis. He was preceded in death by his beloved wife of 62 years, Carola, his parents,

and his brother the Reverend John Bratt. Wally graduated high school from Minnehaha Academy and completed his bachelor's degree in Geology at the

University of Minnesota, while also enrolled in ROTC. After graduating, he served in the Air Force in northern Alaska. Following his military service, he briefly worked for Gulf Oil Company in Texas but soon realized that his home was in Minneapolis. On June 19, 1959, he married Carola Palmberg. Throughout his career, Wally worked as an engineer for Honeywell, Rosemount Engineering, and Control Data, and as a hydrologist for Johnson Well Screens.

He also helped found Bratt Tree Company with his sons, Jonathan and Stanley. Beyond his professional endeavors, Wally was an active member of his community. He dedicated decades to serving on the Hennepin County Park Board and the Minneapolis Park Board, making significant contributions to the establishment of the Light Rail System as well as preventing Northern States Power Company from diverting Saint Anthony Falls to a much larger hydroelectric plant.

Wally was a lifelong member of the Covenant Church where he found joy singing in choirs. He loved to travel and was eager to share photos and stories from his journeys to China, Chile, and Mexico, as well as many canoe trips to the Boundary Waters Canoe Area and Quetico Provincial Park. He had particularly fond memories of trips to Yellowstone and Alaska with his son Stanley and daughter-in-law Teri. He was a voracious reader of historical and geological texts, filling pages with highlights and notes.

With his passing, we lose a library of knowledge. Wally is survived by his two sons, Jonathan Bratt (Karen) and Stanley Bratt (Teri), along with his granddaughters Anika Bratt (Ross), Annalise Walsh (Connor), and Johnna Bratt (Josh). Additionally, he leaves behind four great-grandsons. A private memorial and burial have been organized, with the Williamson-White Funeral Home and Cremation Services of Amery handling the arrangements.

Guestbook: www.williamsonwhite.com

Notes from the Past

From the Fall and Winter 1964 edition of *The Minnesota Geologist*, Official Bulletin of the Geological Society of Minnesota

The Minnesota Geologist: No bulletins were published in 1963. Early in 1964 one issue was circulated, followed by a second issue a few months later.

When we were notified by the Koppens, our former editors, of their contemplated move from the city, it was realized that all books, records, paper stock, and equipment such as a typewriter and copy machine - in fact, all material and property of the Geological Society - would need to be moved. We immediately began to search for a new place to store these materials and equipment. Some of the books, records, and rocks were moved to the Izaak Walton League Club House (8816 North Lyndale Ave.), and the equipment, paper, and supplies were moved to 5321 Chowen Ave. S., the home of Mrs. Robert C. Jensen, adjacent to the home of Mr.

Engen. Mrs. Jensen will be cutting the stencils and making copies of the bulletin. Shortly after the Koppens left, our newly appointed editor, Miss Patricia Summerfield, informed us that because of a change in employment she was leaving the Twin Cities and gave notice of her resignation, leaving us without an editorial staff.

According to the former staff assistants on the Board, we did not have the "know how" to operate the copying equipment, so our notices to members, as well as field trip notices and programs, had to be produced with outside help. Within the last week a representative of the copy equipment manufacturer checked and repaired it and showed Mrs. Jensen and Mr. Engen how to operate it.

Collection and preparation of material for the bulletin has taken until the last week of November, and it was delivered to Mr. Engen for stencilling and copying by Mrs. Jensen. We are now hopeful that the bulletin will be ready for distribution early in December. It will be noted that it is numbered Vol. XVIII - Fall and Winter, 1964--No. 3, to correct the former numbering irregularities and give the bulletin consecutive order. We regret the delay in issuing the bulletin, but the conditions contributing to it were beyond our control.

Member Profile: Kate Clover



Kate Clover on an ILSG geology field trip to Iceland, July 2022

I've had a life-long interest in geology. If I could trace it back to my childhood, I'd have to say it was sparked on family trips to Beaver Island in northern Lake Michigan where we would walk the beaches and pick up fossils: chain corals, Petoskey stones, horn corals and even trilobites. Before catching the ferry from Charlevoix to the island, we'd camp along the Lake Michigan shore and the Straits of Mackinaw and no doubt we found fossils there too. My parents were intrigued as well and found a 1960's era book: Guide to Michigan Fossils. I recall reading that book and learned that Michigan was once covered by a tropical sea; the marine fossils we were finding had lived in that sea long ago.



The Phacops trilobite I found as a kid.

That idea kind of shook my world and opened my eyes. Michigan hadn't always looked like what I knew. Growing up in Muskegon, Michigan and a 10-minute drive to Lake Michigan, I also knew well the expansive, white "sugar-sand" beaches and dunes that were our playgrounds. We loved the lake for swimming, fishing and boating, as well as the dunes for sledding in the winter and hiking under the giant white pines and beech trees in the spring and fall. It was a special place. Summer family vacations also took us to Lake Superior, to the Keweenaw Peninsula of Michigan, where I first saw dark sand beaches. That discovery too also made me question, why was that sand dark in color? Something else to learn. However, the dark sands resembled the rocks and bedrock along the shoreline, so I figured that out pretty fast. But that did spark an interest in sands and how they could vary from beach to beach. Fast forward more years, and I studied geology at Michigan Tech in Houghton, and earned a double major in Geology and Scientific and Technical Communication. Later came an MS in Education from River Falls, WI. My interest in sands, marine sands in particular, also led me to study marine biology through Clemson University and on Andros Island in the Bahamas. Remarkably, this combo of academic learning landed me a job at the Science Museum of Minnesota, where I taught lots of classes to kids. As the job evolved, I wrote training materials and developed volunteer-led activities around the special exhibits the museum hosted: Pompeii, Maya, Space, Pirates, Sharks, Vikings, and many others. With my background, I was given the job of connecting geology and the earth sciences to each exhibit. The best part of this was talking to people in the science community, distilling information from them, teaching this to staff and volunteers who in turn worked with youth and the general public – people of all ages. I found this genuinely rewarding. When the Science Museum opened its "new" building in December 1999, I was given the job of opening and running the Collectors' Corner (CC). There, kids of all ages could bring in objects from nature (rocks, shells, snake sheds, insects, skulls, bones. . .) and earn points for their knowledge and their object. As all sorts of objects came in, we learned along with the finders, figuring out what that fossil or insect was. For the kids out there with particular passions for whatever their science niche/interest, the CC was (and continues to be) a destination for them to share their interests and passions with a non-judgmental person. Yes, it is good to be a ten-year-old interested in the life cycle of dragonflies. I retired from the museum in 2017 after 26 years; it was a great job that satisfied my quest for learning, and it kept me engaged with people through teaching. At some point in the mid-1990s, I learned about GSM through Science Museum volunteers Marlys and Alex Lowe, both GSM members, and both of whom had served as GSM Presidents. Since joining, I have twice served on the board and have been the GSM Newsletter editor since 2020. I've helped staff the State Fair booth, represented GSM at the MN Mineral Club Show, and MN Earth Science Teachers' Conference. And I've attended a few of the GSM field trips as well as leading the Platteville Limestone city tour during COVID. I've also worked on the re-do of Minnehaha Marker. I wish I

"sugar-sand" beaches and dunes that were our playgrounds. We loved the lake for swimming, fishing and boating, as well as the dunes for sledding in the winter and hiking under the giant white pines and beech trees in the spring and fall. It was a special place. Summer family vacations also took us to Lake Superior, to the Keweenaw Peninsula of Michigan, where I first saw dark sand beaches. That discovery too also made me question, why was that sand dark in color? Something else to learn. However, the dark sands resembled the rocks and bedrock along the shoreline, so I figured that out pretty fast. But that did spark an interest in sands and how they could vary from beach to beach.

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could say that project has been completed - perhaps this year. The things I like best about GSM are the people I've met, and learning from the speakers and the labs.

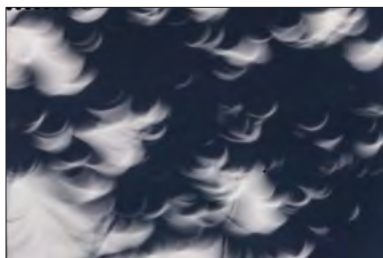
Over the years, I've collected sands from around the world and I currently have about 2000 in my collection, most in small vials. Many of those I collected myself and others I have traded. I love looking at sand samples under the microscope and figuring out what rocks, minerals or marine organisms make up the sample. The "sugar-sand" from my childhood "was" about 98% pure quartz, "was" I say; today, it's sadly contaminated with zebra mussel shells. The dark sand from the Keweenaw is made of basalt, copper-related minerals and grains derived from points north and deposited by the glaciers. I enjoy researching the regional geology about various sands and figuring out what the grains have to tell about their geological origins. Likewise with sands from marine environments; it's been fascinating learning marine biology through sands. Plus, I've been fortunate to work with great photographers who can capture the intricate beauty of sand grains: minute garnet crystals, bryozoans, or industrial slag. My favorite sands: a garnet-rich heavy mineral sand from Lake Winnibigoshish, MN and a biogenic sand full of molluscs, sea urchin spines, forams and bryozoans from Corsica, France.

I'm consider myself pretty fortunate. When I retired, I told myself that I needed to keep my head, hands and feet engaged. That's working for me

Great American Eclipse - April 8, 2024z

Readers of this newsletter will recall the articles I wrote about the last eclipse in 2017. That one started with a week of workshops and trips all around Nebraska. This time there was no GSM trip, because of problems with hotel reservations. Indeed, many people who made reservations had them cancelled for various reasons, and then the same motels were again available at triple or more the rates.

I decided to go to Ohio, because my mother lives there, and I can stay at her house for free. I planned to arrive in Ohio early, and visited a few places the weekend before. On Monday, my sister and I set out at 10:30 am to New Hampshire, Ohio, a town of about 200 people at the corner of US33 and Ohio385. The eclipse started at about 2pm, and totality was at 3:10. I figured a small place would not be crowded, and it was on the line of



As totality neared, the partially eclipsed sun produced crescent shadows in southern Illinois about 50 miles east of St. Louis, Missouri. Photo by Mark Ryan.

maximum totality. It took about 1 hour 40 minutes to make a nominal 1:15 trip, so not bad at all. On the way, we passed through Russells Point and Indian Lake, and saw the aftermath of an F4 tornado that tore through the area a couple weeks ago. Many houses were

damaged, and trailer parks and an RV park were especially bad. There was much twisted metal and general destruction. Many trees were just snapped off, and these were big mature trees.

We arrived around noon, and the day was mostly sunny (light overcast) and about 70°. Perfect weather. We parked behind the Tastee Freeze. Unfortunately, it was not open, so no ice cream for us.

Oh well. People came and went looking for ice cream all the while we were there. Then a truck parked, and a family said they were there for the eclipse. And then shortly before it started, two cars arrived with a large family from the Detroit area. Four cars and about 17 people in all watched from the parking lot. It was congenial but not crowded at all.

My other sister started late, got jammed up in traffic (they warned us about starting early) and turned back, and watched a 99% eclipse from her deck.

We had our eclipse glasses, and I made a pinhole viewer, which worked though it made a small image that was tough to resolve with old tired eyes. Still, what do you expect from a beer can box?

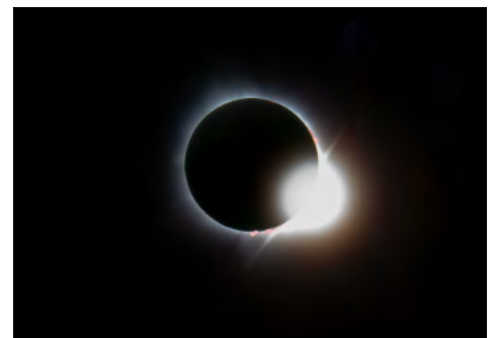
The eclipse started, and it was great. It is always slow starting, but as it progresses things move more quickly. At about 50% my sister was surprised to note the light had changed. At about 75% it was noticeably cooler and less bright. She was amazed at the light changes and the cooling. I had told her about both, but the reality was apparently more than I had described. Then it was almost total, and then totality! The sky was light overcast but we saw the totality clearly, Venus was on the right, and Jupiter was on the left. We did not see Mars and Saturn (far right) or the comet—nearer left. Still, it was wonderful. There was twilight in all directions. It never gets totally dark,



View of the total eclipse near Nashville, Illinois about 50 miles east of St. Louis, Missouri. Photo by Mark Ryan



Close-up of solar prominences captured during the eclipse's totality phase near Nashville, Illinois. Photo by Pat Ryan.



The appearance of the "Diamond Ring Effect" marked the end of totality near Nashville, Illinois. Photo by Mark Ryan.

but it is definitely darker than it was before, and that contrast is notable. Three minutes 56 seconds of totality was too short, but longer than Nebraska. At the bottom was a bright red solar prominence, which was different. The corona itself was small and not really noticeable, but the solar prominence made up for that.

Then it was over and the sun came back. After a few minutes, we made our way back, and it was not as easy as getting there. We stopped at McDonald's for food and a rest stop, and then made our way home. The traffic was heavy and very slow. There was one accident which caused a big jam, and then other jams for seemingly no reason. We tried to go back on another route, but really every route was slow. Passing through Delaware, we saw that Rutherford B. Hayes (the bronze statue in town) wore a pair of eclipse glasses. Good for him. It took almost 4 hours to get back. We were exhausted, but it was totally worth it.

There is not another total eclipse in America for more than 20 years, so this one will have to do. Many people traveled to see it, and it took a course through many big cities, so many people had the chance to see it. The eclipse route was remarkably clear of clouds; even in Texas people had relatively good viewing, despite clouds and storms. And there were programs about the eclipse and science and good stuff in general beforehand, so education was elevated for sure. Despite the crowds and traffic, a good time was had by all.

Deborah Naffziger

Macalester Lab - February 17, 2024

Forty-two people from GSM gathered at Macalester College to participate in a lab on fossils on a Saturday morning in February. Most arrived early and looked at the dinosaur skeletons and other interesting rock exhibits on display in the hallways. There were fewer rocks than usual, but a student said they were getting stuff back. There was one young person in the group, the eight-year-old grandson of Dan Japuntich.

We gathered in a classroom and Jeff Thole, our host and Geology Department Laboratory Supervisor gave a short talk about the five big extinction events, and how volcanism had a strong effect in a couple of them. Then



Jeff Thole spoke about the five big extinction events.

we headed to the labs to look at fossils. Roger Benepe and Steve Willging had brought their collections, and what collections they were! Fossils were classified by era, and there were lots. Lots of trilobites, many bivalves and clams and corals and stromatolites. There were also leaf impressions, a few fish skeletons and lots of ammonites. Some of the trilobites were in matrix and had been carved out with their antennae showing. That took care and love for sure. Both

have collected for decades, and they showed us their enthusiasm for the subject. Jeff said he was glad they brought their stuff, because Macalester didn't have much he could show.

Roger brought about 40% of what was there, Steve about 40% and Macalester about 20%, so we are grateful to our members for their fossils.

In a corner, they had a microscope where many small bony fish jaws were set out for inspection. People moved around and examined. One impressive thing was an array of barbed teeth from an ancient fish. I would not want to encounter that guy in the water. The teeth were up to 2" long, which was just scary.

Across the hall were set up many sample boxes for people to examine and figure out what was what. They also had a few microscopes for people to view and sort microfossils.

After the fossils were examined, a few folks went across the hall, and watched as Jeff looked at sand grains in the SEM (scanning electron microscope) to help identify them for Kate Clover (she of the sand calendars). The microscope fires high energy electrons at a sample, and the way they reflect off the sample identifies the elements present. From the elements, you then figure out the mineral you are looking at. Jeff really loves the



Floydia gigantea gastropod (snail) encrusted with an *Aulopora incrustans* coral from the Devonian Period, Rockford, Iowa. Photo by Steve Willging.



Roger and Steve's impressive fossil collections covered multiple tables.

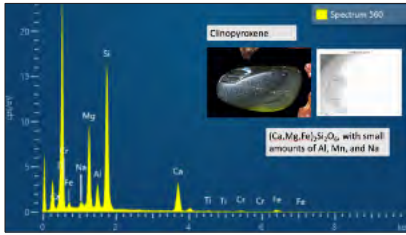


Dan Japuntich and his grandson Spencer enjoyed looking at the fossils.



Steve Willging and Vernon Schaaf looking at a *Floydia gigantea* gastropod (snail) encrusted with an *Aulopora incrustans* coral from the Devonian Period, Rockford, Iowa.

microscope, and has a lot of experience using it; he sees a scan and almost instantly identifies the mineral. There were surprise grains: clinopyroxene, rutile, and monazite – a mineral which contains all sorts of rare earth elements, not just olivine or garnet, though those were also found. It was exciting to look at each grain and watch as the elements were revealed, and then to figure out what the sample was from the elements. Color alone is definitely not a good identifier.



SEM scan of clinopyroxene from Floreana Island, Galapagos. Inset into the blue box is a photo of the green sand grain.

It was a fun and instructive morning, and we are all grateful to Jeff Thole for letting us come and enjoy the delights of Macalester another year.

Deb Naffziger
Photos by Mark Ryan

STEM Day at Mill City Museum February 23, 2024

GSM hosted a table at the science, technology, engineering, and mathematics (STEM) event at Mill City Museum on February 23, 2024. GSMers Kate Clover, Mary Helen Inskip and Patrick Pfundstein staffed the table and talked to a steady stream of kids and their families.

Patrick brought his mineral ID kit and guided kids on identifying rocks with magnets, streak plates and mild acid (vinegar). The calcite bubbled, the magnetite was attracted to the magnet and when tested with the streak



Patrick uses his iPad to demonstrate the Rock Identifier App with kids and parents.

plate, the magnetite showed a black streak and the hematite showed a red/brown streak. Patrick also had kids use the "Rock Identifier" app on his trusty iPad to ID minerals. The app is not foolproof, but it pretty consistently correctly identified the amethyst and calcite. The Rock Identifier App notes the mineral's chemical formula, its hardness and if it is magnetic. We found that having good light helps to get a correct ID.



Mary Helen compared and contrasted pyrite with the gold-colored muscovite from the GSM collection.

Kate spoke to the adults about GSM lectures. She also showed a collection of Great Lakes sands and a photo of magnified sand from Madeline Island. She highlighted the rounded quartz, angular feldspar, and granite grains in the photo.

Curiously, the table to GSM's was hosted by the American Chemical Society; there, kids were crushing Cheerios with mortars and pestles and extracting iron with a magnet. We also explained that iron came from rocks. Curious? A 1 1/2cup serving of cheerios has 12.6 mg of iron; it's very fine-grained magnetite.



Crushing Cheerios and extracting iron

Kate Clover, photos and story

St. Paul's "Biblical" Flood: The Story of Highland Creek

By Greg Brick, PhD

"Where did that un-heard-of quantity of water demanded by the proposed explanation come from in so short a time?"

J Harlen Bretz (1969)

Introduction

Highland Creek is so small that I didn't even include it in the streams chapter of my 2009 book SUBTERRANEAN TWIN CITIES. But it turns out that it has a big secret, revealed here for the first time: it was once the highest volume stream in the city of St. Paul—larger than Phalen Creek or Trout Brook. The flood of water the creek briefly experienced in prehistoric times must have been enormous.

Charlie Evans, of St. Paul Public Works, assembled materials for the first biography of Highland Creek, which I wrote up as a blogpost for the Streets.mn website (Brick, 2024). We did not find the name "Highland Creek" on historical maps, however, so it was presented there for the first time. The stream is so obscure, even to residents of Highland Park, that I will first describe its original, natural course in terms of today's landmarks. But it should be understood that the stream itself has been repeatedly diverted, as described below, so the water no longer follows this continuous path (Figure 1).

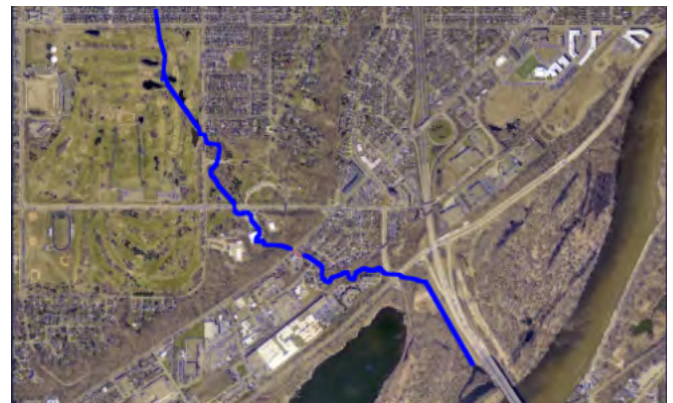


Figure 1. Reconstructed course of Highland Creek (blue line) through the city of St. Paul, as shown on a modern airphoto. The stream was subsequently diverted and buried at several locations. Graphic by Charlie Evans.

Beginning in a former wetland near the north edge of what is now the Highland National Golf Course, Highland Creek flowed south, entering a shallow ravine that can still be seen as a chain of ponds on the golf course. At the 18th Hole, it crossed under Hamline Avenue into the tree-lined ravine at Beechwood, flowed under Edgcombe Bridge and into what had been Highland Lake. At the south end of the former Highland Pool, it entered a buried pipe that runs under Circus Juventas, emerging in the deep ravine across from Mickey's Diner, on Fort Road— hereafter called "Mickey's Ravine," for convenience. From there it flowed under Fort Road by a stone culvert and entered a lower ravine in Kipp's Glen Terrace Addition. It flowed

under the railway trestle (later embankment) of the Ford Spur (a sidetrack which led to the Ford Motor Company plant in Highland Park), through a sandstone gorge, to the Mississippi River bottomlands, where Lake Crosby drained into it. Quite a journey for a stream just over a mile and a half long!

Following the course of the stream on foot recently, however, I found that Mickey’s Ravine is far wider than expected. This is what geologists call an underfit stream. What could have carved this giant ravine, if the present stream was not responsible? While there are many other divots along the miles of bluffs here, they are usually much smaller and due to erosion by flowing springs (Brick, 1997).

Emerging from the Mists of Prehistory

Highland Creek is depicted on Thompson’s 1839 map of the Fort Snelling Military Reserve, where it can be seen flowing through a deep ravine (Figure 2). An early settler



Figure 2. “Map of the Military Reserve, Embracing Fort Snelling,” 1839, earliest known depiction of Highland Creek (red circle). Courtesy of MHS.

lived nearby: “W.G. Carter, or as he was called, ‘Gib’ Carter, lived on the Fort Road and died there in 1852. He came from Virginia” (Newson, 1886, p. 47). Carter was one of the original signers of the memorial to Congress drafted in 1848 for organization of the Minnesota Territory (Anon., 1898). Carter’s house sat along what was an earlier alignment of Fort Road, connected to the



Figure 3. Carter’s Road running from the conjectural location of Carter’s house on Fort Road, up Mickey’s Ravine, to connect with what is now Montreal Avenue, graphic by Russ Hanson.

west by a road running up through Mickey’s Ravine. In the 1867 Andreas Atlas of Ramsey County, Carter’s Road is depicted in the ravine, connecting Fort Road to the stub end of what is now Montreal Avenue, which was not graded to connect directly with Fort Road until years later. In 1887, Reserve Township, which contained the Highland Creek watershed, was annexed to the city of St. Paul (Empson, 1973) (Figure 3).

Lake Highland and its Descendants

In 1925, Highland Park (the park itself, not the neighborhood) was officially dedicated, and in the following year, Highland Creek was dammed back to form Lake Highland. According to George L. Nason’s newspaper column, “Visiting Around St. Paul Parks,”



Figure 4. Lake Highland (upper right) as depicted in Hopkin’s Atlas, 1928.

“The Park bureau tried to name it Lake Highland, but boys soon called it the Highland swimming hole” (Nason, 1932).

“The artificial lake will be 500 feet long and 100 feet wide and will be fed by springs” — equivalent to four Olympic-sized swimming



Figure 5. The Lake Highland swimming hole in 1930, courtesy of MHS.

poools, but only 3½ feet deep. The springs are likely those belonging to the line of springs known informally as the “Diamond Necklace” (Brick, 1997). But since groundwater is cold, this could make the pool uncomfortably chilly. A dock was built for fly casting and the lake used as a skating rink in winter (Figures 4, 5).

The soil removed to create the swimming hole in 1926 was dumped into the capacious Highland Creek ravine south of Montreal, until 40 feet of fill had accumulated, forming the plateau on which the white bubble of Circus Juventas now stands (Figure 6). Before dumping the fill, a 36-inch diameter concrete pipe was laid down, which received swimming pool drainage — the original Highland Creek. But, “the draining of surface water into the pool

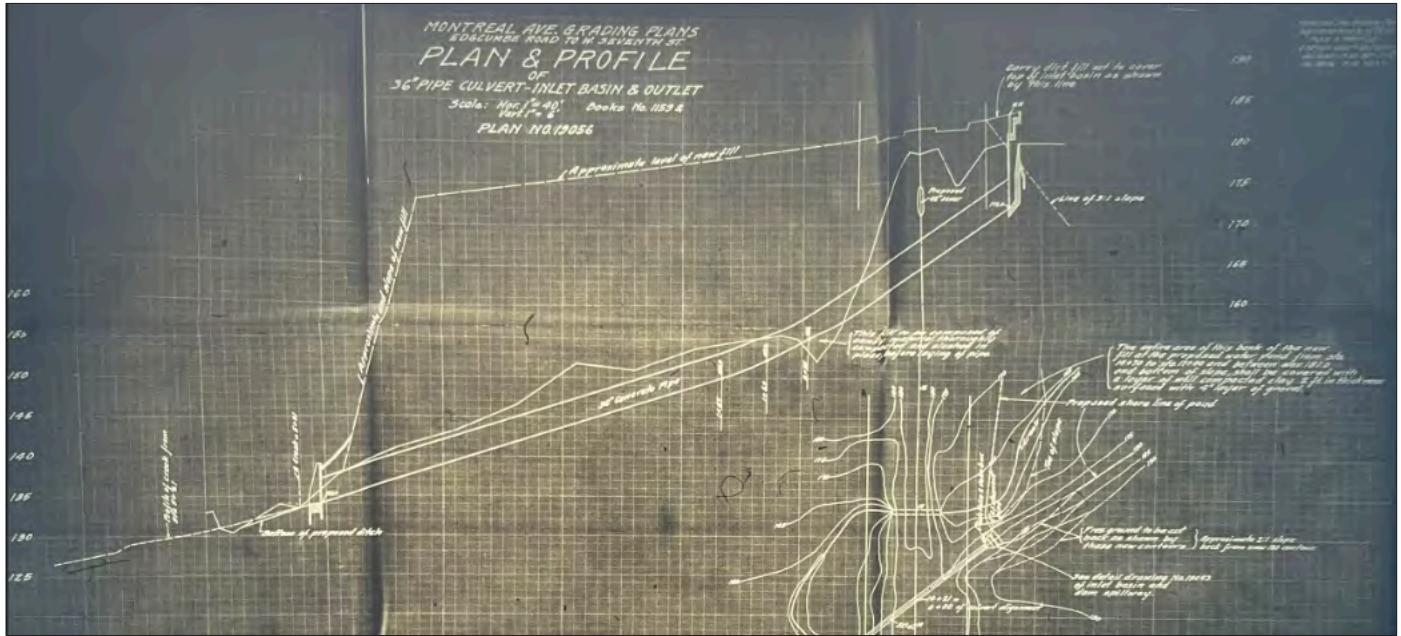


Figure 6. Profile of Mickey's Ravine in 1926, showing the 40-foot-thick plateau of fill burying the 36-inch concrete pipe carrying Highland Creek

and its asphalt lining were judged bad features" (Anon., 1935), so when the WPA rebuilt the swimming pool in concrete in 1936, it was hooked into the city water supply and chlorinated. While the size was reduced to 60 by 120 feet, this concrete pool was still said to be "the third largest in the country" (Anon., 1937) (Figure 7).



Figure 7. The concrete-lined rectangular Highland Pool, built by the WPA and opened in 1936, replacing the much larger "swimming hole." Courtesy of MHS.

In 1951, the swimming pool outlet was disconnected from the 36-inch concrete pipe in Mickey's Ravine and diverted to the Montreal sanitary sewer.

The Highland Creek headwaters, draining to Highland Lake, was depicted in a St. Paul Public Works surveyor's fieldbook from 1912 (Figure 8). In 1936, the landscaping associated with the WPA project involved lining the stream bed with concrete and building four stone footbridges and 12 dams (Figure 9). The footbridges are gone and the concrete lined stream bed was removed but the inlets and outlets still remain in this shallow ravine.

The Highland Park Aquatic Center, featuring the third and present pool, south of Montreal, opened in 1976. The hill upon which the Highland Pavilion stands, which

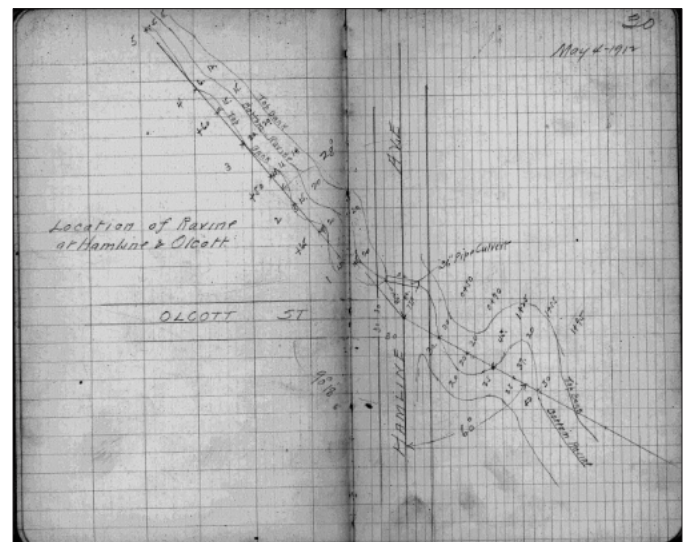


Figure 8. Surveyor's fieldbook from 1912 showing the upper reaches of Highland Creek, where it crosses and then exits from the Highland National Golf Course.

towers over Mickey's Ravine, was part of C.W. Youngman's Addition to St. Paul (1886), and there were even houses here at one time. Summit Avenue South ran alongside the stream itself. Houses can still be seen in Mickey's Ravine in a 1923 aerial photo, but as of 1927, "all streets and alleys in C.W. Youngman's Addition" were vacated (City Council Minutes). By the time of a 1937 aerial photo, no structures are visible at this location.



In its lower course, Figure 9. Highland Creek in its ornamental canal leading to the new pool, 1937. Courtesy of MHS.

however, Highland Creek passes through a densely residential area. On a 1912 plat, the stream is depicted flowing through Kipp’s Glen Terrace Addition to St. Paul (Figure 10). Journalist Oliver Towne referred to this neighborhood as the Family Valley, owing to its



Figure 10. Highland Creek slashes through the Family Valley neighborhood.

interrelated, tight-knit families (Towne, 1959).

The Crosby Connection

In summary, Highland Creek has been diverted at three places along its former course. The upper third (headwaters segment), running from the northern edge of Highland National Golf Course to Montreal Avenue, was diverted when Lake Highland was excavated. The



Figure 11a. The Highland Creek tunnel with its curious “prehistoric cave art” graffiti.

middle third, extending from Montreal to Fort Road—including Mickey’s Ravine—was diverted at Fort Road to where it joins drainage from the upper third and continues downhill. The



Figure 11b. The Highland Creek outfall reunites drainage from the upper, middle, and lower portions of the original watershed, before flowing into the Mississippi River. Photos by author, 2023.

lower third, from Fort Road to Elway Street, only carries local runoff nowadays. While formerly running through the backyards of the houses along Ivan Way, it now flows in a culvert under the Ford Spur, built as a high trestle over the ravine in 1923. In 1931 Kipps Glenn and the trestle were filled in at the same time to form a solid embankment. Nowadays, the stream reemerges from

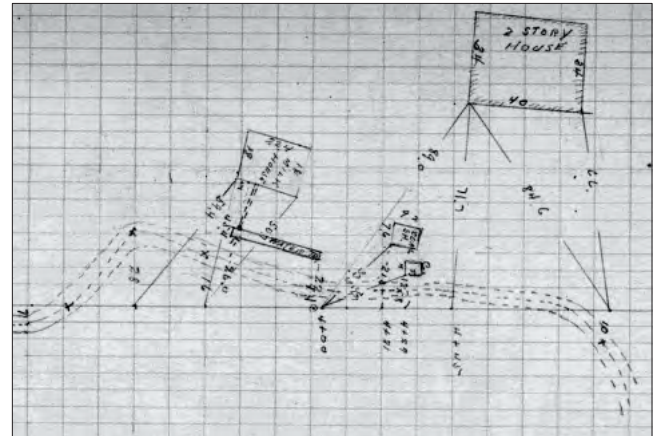


Figure 12. The busy banks of Highland Creek in 1920. Surveyor’s fieldbook showing the Crosby Farm house.

this embankment into a ravine behind the Crosby Pointe condos, diving underground again to cross under Shepard Road.

The Highland Creek outfall, a 60-inch concrete pipe, reunites these three strands (upper, middle, and lower) before discharging to the river bottoms at Elway Street, where the stream meanders lazily eastwards for another half mile alongside the Interstate-35 East bridge before joining the Mississippi River (Figure 11a and b). On the bottomlands, the stream is augmented by drainage from Crosby Lake. A 1920 surveyor’s fieldbook depicts the Crosby Farm house and other structures on the banks of Highland Creek (Figure 12).

Glacial Lake Highland, Mickey’s Ravine, and the Great Flood

There’s no better way to get a sense of how “underfit” present-day Highland Creek is—how much smaller than the valley it is supposed to have carved—than by visiting the stone culvert, constructed of Platteville Limestone, across from Famous Dave’s on Fort Road (Figure 13a). The arch is 3 feet across, built as a culvert to carry the



Figure 13a. Stone culvert under Fort Road, photo by author, 2023.



Figure 13b. Looking upstream in Mickey’s Ravine, possibly carved by glacial floodwater 10,000 years ago, photo by Russ Hanson, 2022.

stream under the street. Now sealed, the waters were diverted to a pipe running under Fort Road to Montreal Avenue about 1931. Compare that diminutive arch with the enormous width (400 ft) of Mickey’s Ravine, through which the stream flows (Figure 13b). And that ravine is much smaller than it was in the historical past, because demolition debris has been tipped over its sides for many

flood carved it, where did all that water come from? One answer is suggested by the 1992 surficial geology map published by the Minnesota Geological Survey (Patterson, 1992) (Figure 14). This map shows glacial lake sediments (colored blue) stretching from what is now Cretin-Derham Hall south to the Highland 9-Hole Golf Course. The map key describes these as “deposits of a

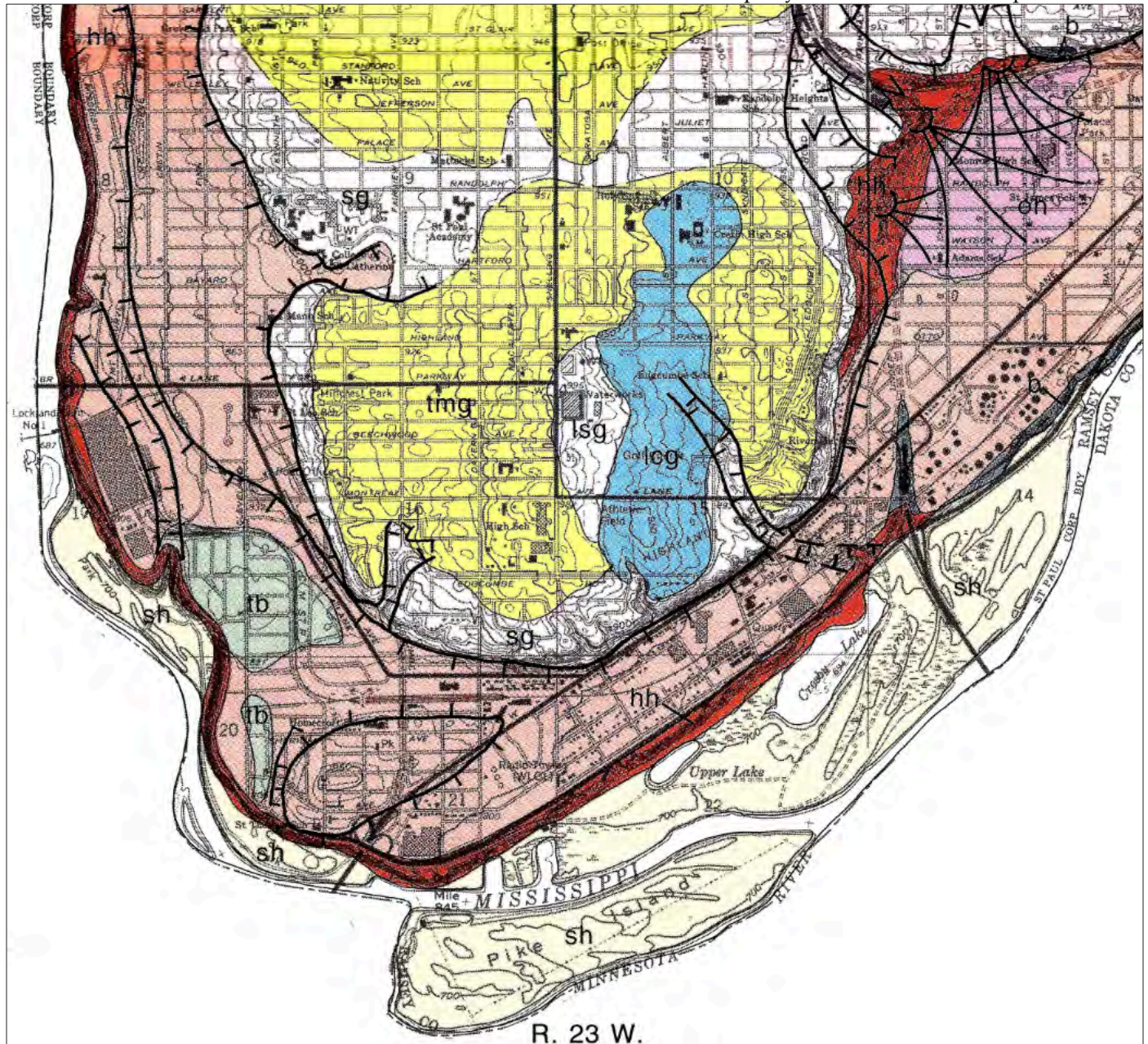


Figure 14. Surficial geology map showing Glacial Lake Highland (blue). The glacial lake, whose ice dam burst in prehistoric times, released a flood that carved out Mickey’s Ravine. The parallel hachured lines depict the meltway leading down the ravine toward the Mississippi floodplain (Patterson, 1992). The unit “lsg” is defined as “clayey lake sediment” and “lsg” as “sandy lake sediment.” For more information see the full map at: <https://conservancy.umn.edu/handle/11299/58233>

years: bricks, concrete slabs, etc. At the head of the ravine sits Circus Juventas on a plateau of filled land 40 feet thick. Indeed, an 1896 topographic map shows Mickey’s Ravine extending even further, all the way north past Montreal. So how could this minuscule underfit stream have carved such a giant ravine? And if alternatively, a

former lake that may have been partially confined by stagnant ice.” This north-south elongated lake, roughly the size of Lake Phalen, formed in likely what was a former ice-block depression of the Grantsburg Sublobe of the last ice sheet. Since the rim of the “bowl” nowadays appears topographically incomplete, it may

be that the lake was confined by walls of “stagnant ice” on those other sides. And judging from the elevations involved, the lake could have been as much as 100 feet deep. At some point, the ice wall on the east side could have collapsed or floated up, catastrophically releasing the lake volume all at once. This could have carved the hachured “meltway” depicted on the geology map, leading from the lake down through Mickey’s Ravine. This flood, or multiples of it, could have carved the ravine through solid rock. Downstream from the ravine, the 1992 bedrock geology map (Mossler and Bloomgren, 1992) shows an underlying gorge carved into the St. Peter Sandstone near the Crosby Pointe condos.

The best local example of this phenomenon, but on a much grander scale, is Glacial River Warren, the predecessor of the present-day Minnesota River. The Minnesota River is today an underfit stream flowing through a wide valley that it did not carve in its present state. Instead, about 10,000 years ago, Glacial Lake Agassiz, an enormous lake stretching well up into Canada along the axis of the present Red River lowlands, and much larger than the present Great Lakes, gave way and its water drained catastrophically to the south and east.

In the western US, there are more examples, even grander, of outburst floods. In Montana, the Missoula floods, whereby Glacial Lake Missoula drained catastrophically to the Pacific Ocean, carving the Columbia River scablands of Washington State along the way, as revealed by famous geologist J. Harlen Bretz (quoted in the epigraph above) in 1969. This would make Mickey’s Ravine a miniature Grand Coulee (Bretz, 1969). Of course, the volume of our Highland Creek outburst was minuscule by comparison, yet larger than the ordinary flow of even our largest present day city streams.

After the prehistoric flood, Mickey’s Ravine was likely occupied by a small waterfall, like that seen in Hidden Falls Regional Park today, even into historic times, though I have not come across any accounts of it in the early travel literature. But the Highland Creek gorge is much wider than the narrow Hidden Falls gorge— an amphitheater compared to a slot canyon— and is associated with a stagnant ice lake, attesting to its different origin.

Conclusion

This article presents the first biography of Highland Creek, with its rambunctious childhood. Examination of the stream reveals evidence of a hitherto unknown prehistoric flood in St. Paul. As a disclaimer, the Highland Creek flood is conjectural and provisional. The Minnesota Geological Survey is preparing an updated edition of its 1992 geologic atlas, and perhaps more evidence will be forthcoming.

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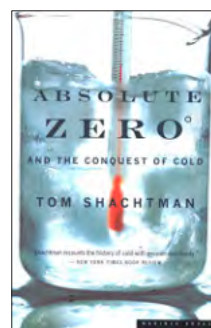
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Book Reviews by Deborah Naffziger

Absolute Zero, and the conquest of cold by Tom Shachtman (1999 Houghton Mifflin)



This is an interesting book that contains a lot more than just figuring out how to get to Absolute Zero. It is about the quest for cold, how to make it, how to tame it, and how to use it. Incidentally, there is a lot of squabbling, acrimony, backbiting, and general scientific jealousy. If you want the dirt about who hated who and how they harpooned each other in historical science, there is a lot of that.

Sometimes it seems he really gets into that and the quest for cold takes a back seat.

Be that as it may, there is a lot of scientific history here. Also a lot of how the techniques of getting colder temperatures made changes in society. Clarence Birdseye and freezing food is one of the big ones, but there are a whole lot more. For once the knock-offs from this research have made a great deal of positive changes

for us all. He goes into lots of side explanations about the changes and what has resulted therefrom. It solidly illustrates that there is really no useless scientific research. But he then gets back to who found the next breakthrough and how it helped us all. There are a lot of Nobel Prizes in the quest for Absolute Zero. And maybe some that were overlooked.

There is a good deal of chemistry, and how atoms behave at super-cold temperatures. Superfluid conductors feature heavily in the last quarter of the book. Helium-3 is a big deal, along with how all this relates to computers and miniaturization. Sometimes the quantum physics is a bit dense, but manageable. The final achievement, a billionth of a degree above absolute zero is somewhat buried. But the journey was well worth it.

I enjoyed this book, for many reasons. The solid history, the science, the backbiting and acrimony, and how all this has helped and made our collective lives a lot better. There is a lot here.

The Disappearing Spoon, and other true tales of madness, love, and the history of the world from the periodic table of the elements, by Sam Kean 2010 Back Bay Books/ Little, Brown and Company, New York.



Periodic Table of the Elements books are a staple in science writing. Sometimes they go element by element, what they are and what they are useful for, and maybe how they were discovered. Sometimes they take an historical approach, the order in which they were discovered and maybe what they are good for. This one is something completely different. Really different. And the

Monty Python reference is intentional since he uses that as well. Quite a bit.

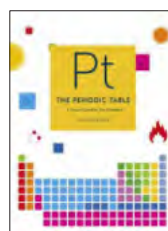
Kean does cover the whole periodic table, but in no particular order. Or maybe an order best understood only by Kean. He jumps around, including history, pithy anecdotes, and chemistry and physics, though physics wins out in the end. One quibble I had was that the periodic table he puts at the end, is somewhat abbreviated. He includes the Symbol (H, Ar etc.) and number and weight, but does not spell out the name of the element, which becomes more difficult as you go up the table. As a Tom Lehrer fan, I have memorized his element song (as well as many others), which goes up to 102. But there a lot more elements now, and some of the names are more esoteric. So using the table was not as helpful as it could have been. Find a modern table and keep it with the book as you read. It will help. Also, it was published in 2010, so realize he may not be up-to-date about everything—like a comet or asteroid hit Earth early on—it was a planetoid called Thea. But that was figured out post 2010.

He groups the elements in rough areas of use and usefulness. And seeing which elements are grouped with each other is somewhat puzzling, until you read the text. You learn that Marie Curie was considered

opportunistic, and not well regarded by the wives of other scientists. Why he did not include that Einstein was a casanova is puzzling in light of this. But this sort of personal detail is what makes this book so entertaining. It was a best seller, and I am not surprised. He does get into chemistry and physics, but lightly. His explanation of alpha (a universal constant that cannot be explained but just exists) is a bit obtuse, but easily glossed over. He has a number of footnotes sprinkled throughout. I highly recommend reading them. Sometimes they are just a book recommendation, but they can also explain tangential things that are fascinating but not necessarily germane to the text. I had two bookmarks, one for the text and another for the footnotes.

There is history, and elemental usefulness, but also anecdotes and human stories about the scientists in the book. The eclectic mix makes it so entertaining. And that is what made it a bestseller. So check it out and read about the people who populated science, and what they discovered. They are an interesting and eccentric bunch.

The Periodic Table, A visual guide to the elements, by Tom Jackson, 2017 Aurum Press, an imprint of the Quarto Group, London



This book is colorful and visually stunning. There are many graphs, charts and illustrations which add to the text. It is one of the 'look at each element and see what it is and how it is used' books. Jackson goes into chemistry and physics, and how the elements are built and interact. There is more chemistry than physics, and that's OK. As a general overview, it accomplishes the purpose well.

There are charts of what elements are in the core, mantle, crust, sea, and air of the Earth. One chart is the chronological discovery of the elements. Another chart shows the origins of the elements (big bang, small stars, big stars and so on). These charts impart a great deal of information with deceptively simple drawings. The book is full of these, some more interesting and illustrative than others. When the text gets small he loses information, but there are few of those.

There are 4 parts: The Periodic Table (how it looks, how it evolved), The Big Picture (talking about atoms generally), Inside Chemistry (explaining about the nature of the elements), and Directory of Elements (each element in order). The illustration of the spiral alternative periodic table is especially fun; it certainly makes you think about the table in a different way.

One quibble - there are a number of mistakes in the text. Things are slightly mislabeled, numbers changed; stuff like that. A thinking person can easily spot these and make the corrections, but it may be why the book was remaindered so quickly. But for the most part, it is useful and a very good guide for what it is. If you give it to a young person, you might point those mistakes out, just to be sure. In the modern world of publishing, more editorial function has been delegated to computers, and

mistakes have increased. Sigh.

It is a quick read, but you learn a lot, and as it is British, there is a bit of a different take on the subject. Enjoy.

The Spinning Magnet, the electromagnetic force that created the modern world—and could destroy it by Alanna Mitchell (2018, Penguin)



This is a fascinating but disconcerting book. There is a lot of history about the discovery of the core of the Earth and the magnetosphere it creates, what it is and does, and then how it has changed over time. The discovery of changing/flipping poles takes up the first third of the book, mostly set in France. And then she goes into electricity and how that was discovered and tamed and then used.

The magnetosphere—the electrical field around Earth that shields us from most of the dangerous emissions of the Sun—is the star of the book, though it waits until later to fully appear. We learn about the core and how it was deduced and all that. And how it makes that magnetosphere and how without it we would be dead—from many causes, such as loss of atmosphere, like on Mars. But the devastating effects of solar radiation would probably kill us before the atmosphere went away.

And that is what makes me feel uncomfortable about it all. She details in many ways what would happen to our modern world if the poles flipped, or even started to flip and maybe did or maybe did not. This has happened many times, and at irregular intervals. The flipping, the starting to flip with 4 or 6 or 8 poles, and then flipping—or not. But all that would cause chaos and probably the end of civilization as we know it. No electricity,

no GPS, no satellites. Without all those things, civilization is doomed. She details it all, and makes it clear there is nothing we can do to stop it or even prepare to ride it out. All this changing of the poles can last as little as 1000 years, but maybe 10,000 years. Yay.

The first part of the book is really interesting and I enjoyed it. The last quarter of the book is doom and gloom and the inevitable end of civilization and maybe humanity itself, and we can do nothing about it. So I guess we just collectively bend over and kiss our butts goodbye. She says we can live underground to avoid the deadly solar radiation, but we lose electricity and the rest, so why should we bother anyhow? I do not like gloom and doom, and the end of this book is full of that.

It's scientific and well written, I just do not like the message it contains, even though it is something we need to think about. Yes, the magnetic field is diminishing, and it may herald a pole flip, but it may not. We just do not know. The history of the magnetic field is just too small to make any sort of definitive predictions. It has been stronger, it has been weaker, and people still survived. Obviously we need more research, though she does not call for it. The book ended with me being unhappy and feeling helpless. My opinion, yours may be different.

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