Historic Iron Mining on the Marquette Range

Leaders: Bob Clark, Cliffs Shaft Museum & Barry C. James, Historian, Michigan History Center, Michigan Iron Industry Museum
Date: August 7, 2022
Time: 7:30 am - 5:00 pm

Attire/Accessibility: The stops on this trip will be indoors and on outdoor paved walkways. Some easy hiking may be required, depending on the outcrops of iron formation which are visited.

We are visiting two museums along the historic Marquette Iron Range to learn about the history and development of the iron industry in Michigan’s Upper Peninsula. The first stop is the Michigan Iron Industry Museum in Negaunee, overlooking the Carp River and the site of the first iron forge in the Lake Superior region. This museum, operated by the Michigan History Center, tells the story of Michigan’s three iron ranges and the people who worked them. The museum grounds also include interpretive trails highlighting mining history of the area.

Lunch is at Jackson Park in Negaunee, developed at the site of the Jackson Mine, the first iron mine in the Lake Superior Region. The park is located adjacent to the Iron Ore Heritage Trail, a 24-mile trail which showcases the role of the iron ore mining industry to the State of Michigan.

Our last stop is the Cliffs Mine Shaft Museum, located in Ishpeming, a site on the National Register of Historic Places. The museum grounds are home to two historic headframes, which served as access to the underground mining operations. The museum also houses historical artifacts representing the local community during the mining era. Historical displays depict miners and past and present mines and operations, headgear and other safety equipment, and displays on blasting and diamond drilling equipment. A rock and mineral display features minerals from the local area, Michigan’s Upper Peninsula, the Midwest and the world. The trip will include a guided tour of the museum, historic grounds, and general mining history of the Cliffs Mine.

Photo credit: Bob Clark, Cliffs Shaft Museum
Leader: Meagen Morrison – Community Relations at Lundin Mining and other Lundin Mining staff

Date: August 7, 2022
Time: 7:30 am - 5:00 pm

"Limited to first 30 registrants

Attire/Accessibility: Participants will be required to wear appropriate clothing, including close-toed shoes. Hard hats, safety glasses, and safety vests will be required and provided by Eagle Mine, but participants may bring their own.

The trip will not include any strenuous hiking. The trip will visit several interior buildings, with short walks between buildings and outdoor areas of the surface facilities at the mine and mill sites.

Samples of the nickel-copper ore will be available for collecting in the coarse ore storage area.

The Eagle Mine is the only primary nickel mine in the United States. Lundin produces high-grade nickel and copper ore from an underground mine. Part one of the trip will include a tour of the surface facilities at the mine, including a presentation and discussion of the geology, mine operations, mining methods, and visits to the coarse ore storage area, wastewater treatment plant, and other surface facilities with an emphasis on the measures being used to protect the environment at the mine site. Ore samples will be available for collection from the ore storage area. Part two of the trip will visit the Humbolt Mill, where ore from the mine is delivered for processing. The processing includes conventional crushing, grinding, and floatation to produce separate nickel and copper concentrates. The mill is a historic iron mine milling facility, which was refurbished into the Eagle Mill. Participants of the tour will see the refining process of the ore, learn about the historic uses of the mill, and the brownfield redevelopment into its current use. The environmental permitting and development history will be discussed.

Photo credit: Jen Heikkala, Lundin
FOUNDATION OF THE AMERICAN INSTITUTE OF PROFESSIONAL GEOLOGISTS
SILENT AUCTION FUNDRAISER

Annual Meeting Welcome Reception
Marquette, Michigan
August 7, 2022 from 6:30 – 9:00 pm
Cash Bar and Auction Preview 5:30 pm

The Foundation of the American Institute of Professional Geologists will hold a silent auction at the AIPG Welcome Reception on Sunday, August 7th starting at 6:30 pm at the Exhibit Area in the Northern Center. We hope you will consider a donation (such as mineral/rock specimen, books, antique or historic items, artwork, jewelry, maps, or other items of interest) to the silent auction to raise funds in support of the Foundation for AIPG programs, scholarships, internships, and various initiatives. We also encourage you to consider bidding on items at the auction. Bring your checkbook!

Adam Heft and the AIPG Michigan Section have kindly volunteered to organize the silent auction on behalf of the Foundation.

We also appreciate some advance notification to help us plan for the numbers and types of donations. Please bring items to the annual meeting registration desk prior to the silent auction OR you may ship them to Adam Heft prior to August 1st. Include a copy of the 2022 Silent Auction Donation Form with your donated item. Please consider donated item size and travel safety regulations. The winning bidder will need to transport the item. Please send a copy of the completed donation form to me in advance and also include a copy with your donated item(s).

If you have any questions or need additional information about the Foundation and/or silent auction, please contact:

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We look forward to seeing you at the Silent Auction for an evening of fun and friendship and an opportunity to support the Foundation of the AIPG.

Barbara Murphy
Chairperson, Foundation of the AIPG

THANK YOU FOR YOUR SUPPORT

The Foundation of the American Institute of Professional Geologists is a 501 (c) (3) public foundation, qualified to receive contributions in support of educational programs. Contributions and gifts-in-kind are tax-deductible.

FEATURED AUCTION ITEMS

Eagle Mine Ore Specimen • Seaman Museum World-Class Mineral Specimen • Amethyst Cathedral
One-of-a-kind Michigan Rocks & Minerals • and much more
Minerals & Falling Water

Leaders: David Adler, CPG, Mannik Smith Group, and Adam Heft, CPG, WSP

Date: August 7, 2022

Time: 7:30 am - 5:00 pm

Attire/Accessibility: Closed-toed shoes or hiking boots. The trip will include a hike up a hill on an irregular pathway; the elevation gain is about 100 feet. Other portions of the trip involve hiking across rock, which may be slippery. The Champion mine dump piles may include unstable rock piles and should be treated with caution if climbed.

Samples of the material on the Champion mine rock piles will be available for collecting.

The first portion of the field trip features the natural beauty of the Upper Peninsula wilderness, the fascination of falling water, and the ancient bedrock geology of the Marquette area. Our first stop will be at the Dead River Gorge and the confluence of Reany Creek and the Dead River located just outside the city limits. Along the riverside trail through Dead River Gorge we’ll see several scenic waterfalls, some of which are quite spectacular. The bedrock here is Lower Precambrian (Archean) metavolcanic rocks of the southern Canadian Shield. Before leaving this area, we’ll also take a short walk up the narrow gorge of Reany Creek just upstream from the confluence to see 3 more waterfalls and numerous intervening cascades. The bedrock at Reany Creek is the Archean Compeau Creek Gneiss, consisting of intrusive igneous and metaigneous rocks. Our last stop is along Lakeshore Drive and the Marquette bike path where Whetstone Brook flows into Lake Superior, just a short walk from downtown Marquette. Here we’ll see a very scenic unnamed waterfall known to locals but overlooked by waterfall guidebooks. The bedrock here is schistose and massive metabasalt, actinolitic and chloritic schist, and ellipsoidal greenstone of the Mona Schist Lower Member. Some of the best exposures of the ancient pillow basalts can be seen here. There will be great views of Marquette Harbor and the old Marquette ore docks.

The second portion of the trip will feature mineral collecting at the Champion mine rock piles. This mine began operating in 1867 and continued for 100 years. Total iron ore production from this location was in excess of 7 million tons of iron ore, making it one of the more prolific mines west of the Tilden/Empire mines near Marquette. Champion is within the staurolite zone of metamorphism. At least 75 different minerals have been identified at Champion. We will have the opportunity to look for and collect samples from the rock piles.

A final stop will be in the town of Ishpeming at Jasper Knob. Here, participants will be able to see a world-class example of banded iron formation that has been extensively deformed.

Photo credit waterfall: Dave Adler, CPG-11377
Sandstone Cliffs and Glacial Features of the Pictured Rocks National Lakeshore

Leader: Robert Regis, PhD., Professor Emeritus of Geology, Northern Michigan University

Date: August 9, 2022

Time: 7:30 am - 5:00 pm

Attire/Accessibility: The trip will consist of easily-accessible waterfalls, overlooks, and a 2-hour boat trip on Lake Superior. No special instructions or clothing is required.

Pictured Rocks National Lakeshore, located approximately 30 minutes east of Marquette, is America’s first National Lakeshore. The Park features 50 to 200-foot high sandstone cliffs that extend for more than 15 miles along the shoreline. Sea caves, arches, blowholes, turrets, stone spires, and other features have been sculpted from the cliffs over the centuries by waves and weather. The cliffs consist of Mid to Late Cambrian-aged Munising Formation and the Early Ordovician-aged Au Train Formation. The Munising Formation is a gray to white sandstone, representing a complex shoreline/shallow water environment that was influenced by river, wave, tidal, and wind processes. The Au Train Formation is a light brown to white dolomitic sandstone that lies above the Munising Formation. The name “Pictured Rocks” comes from the streaks of mineral stain that decorate the cliffs, formed when groundwater seeps out of cracks and trickles down the rock face. Red, orange, blue, green, brown, black, and white decorate the cliffs.

The best way to observe the sandstone cliffs is from Lake Superior, so this trip will include a 2½-hour boat cruise along the cliffs to observe the cliffs and erosional features up close. Waterfalls are abundant in the area, and the trip will visit some of the easily-accessible falls, as well as learn about the complex glacial history of the area.

Photo credit: Al Blaske, CPG-10529
**Tilden Iron Mine and Mill**

**Leaders:** Cleveland-Cliffs geology staff  
**Date:** August 9, 2022  
**Time:** 7:30 am - 5:00 pm

Attire/Accessibility: The trip will take place in an operating, open pit iron mine, as well as in a large industrial facility. Closed-toe shoes will be required, and steel-toe boots recommended. Safety vests and hard hats may be available from Cleveland Cliffs, but participants are encouraged to bring their own. Sample collection will be allowed in the iron mine, however, photographs are prohibited.

The Tilden Mine is an open-pit iron mine located near Ishpeming and operated by Cleveland Cliffs. Tilden’s operations consist of an open pit truck and shovel mine, a concentrator that utilizes single stage crushing, milling, magnetite separation and flotation to produce hematite and magnetite concentrates. The concentrates are supplied to the on-site pellet plant, which produces marble-sized pellets which are transported by rail to port at Marquette. The open pit is over 2 miles long, 1/2 mile wide, and more than 1,200 feet deep.

Tilden extracts low-grade ore (taconite) from the Paleoproterozoic (~1,875 billion years) Negaunee Iron Formation. The Negaunee Iron Formation consists of a variety of iron rich rocks in the Marquette area, including carbonate iron-formation (iron carbonate and chert with minor magnetite), oxide iron formation (hematite or magnetite and chert), magnetite-banded iron formation (laminated hematite and chert), hematite banded iron formation (laminated hematite and chert), silicate iron formation (iron silicate minerals and chert) and combinations of these types. The origin of the iron minerals in the Negaunee Iron Formation is a complex combination of primary sedimentary depositional, diagenetic, and metamorphic processes.

To make the ore usable, the iron formation is ground into powder and the iron minerals separated using magnetic and flotation techniques. The iron-rich powder is then mixed with water and clay into a slurry that is shaped into pellets, heated, dried, and shipped to steel mills. Crude ore is approximately 35% iron and is upgraded to 65% before pelletizing.

This trip will visit the operating Tilden open pit mine, as well as the processing facility where the ore is turned into pellets for shipment to steel mills throughout the Great Lakes region.

*Photo credit: Google Earth, 2022*
Keweenaw Copper Mining and History

Leaders: Dr. Theodore Bornhorst, Professor Emeritus, Geological and Mining Engineering and Sciences, Michigan Tech University

Date: August 9-10, 2022

Time: Two full days - The Keweenaw Peninsula (Houghton Michigan) is 100 miles from Marquette. An overnight stay in Houghton will be necessary.

Attire/Accessibility: The trip will consist of walking on a variety of surfaces, including underground and on waste rock piles. Therefore, closed-toe shoes (hiking boots or shoes) are recommended.

The Keweenaw Peninsula is the location of a dormant billion-dollar native copper mining district. Mining began in 1845 and continued to 1968, and the mines of the region produced 11 billion pounds of refined copper. The copper deposits are unique, in that the metal is present in the native form, and not in the typical sulfide, carbonate, or oxide form. The copper deposits are contained within the Portage Lake Volcanic sequence, a series of rift-filling volcanic rocks with minor clastic sedimentary rocks.

This two-day trip will examine the geology and history of the mining district, examining the geology of the Portage Lake Volcanic series, as well as the mining and milling methods to liberate the copper, and the environmental impacts of decades of mining. The trip will include a visit to the Quincy Mine Steam Hoist, an underground tour of the Quincy Mine, a visit to the historic Quincy Smelter, and a visit to the Torch Lake area to observe reclamation efforts associated with mining waste products. The trip will also visit the Keweenaw National Historic Park visitors center in Calumet, to gain an understanding of the human aspect of the copper boom in the peninsula. Finally, the trip will include the world-famous A. E. Seaman Mineral Museum to observe the spectacular native copper and associated mineralization of the region. Time permitting, mine waste rock piles will be visited to see the geology and mineralogy of the famous Keweenaw native copper deposits.

Photo credit: Al Blaske, CPG-10529