

LAKE SUPERIOR TRIP—2004

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The Geology 916 course discussed the Precambrian geology of the Lake Superior region last spring. After the course, John Valley and seven graduate students went on a regional geology field trip to visit the areas they had studied. Beautiful Wisconsin spring weather preceded the trip and was thought to be an omen for a pleasant journey; needless to say this was far from the truth.

The group departed Madison on May 12 for Duluth, MN, and made a stop in Ladysmith, WI to observe the restored Flambeau supergene-enriched Cu-VMS mine. We were met by UM-Duluth emeritus professor John Green the following day for a tour of Midcontinent Rift-related geology. During cold, rainy, and windy weather, we examined pre-rift Mesoproterozoic sedimentary rocks at Thompson Dam, Duluth Complex mafic igneous rocks, and North Shore Volcanic Group basalt flows and interflow sedimentary rocks.

The focus of the following day was the Mesoproterozoic and Archean geology of Minnesota's "Arrowhead". The group enlisted the help of local expert Dean Peterson, adjunct assistant professor at UM-Duluth and consulting geologist. Our geological destinations during the cloudy and cold day were the Mesoproterozoic Biwabik BIF (Thunderbird Mine, Virginia, MN) and metasedimentary and metavolcanic rocks of the

Archean Vermillion Greenstone Belt. The group finally got to warm up during a tour of the underground Soudan Mine. This former iron mine (Soudan BIF) is now the host of the High Energy Physics Lab. and a giant underground neutrino detector.

After a night of camping off a possible ATV trail in the woods of northern Minnesota, the group was finally treated to some sunny and pleasant weather. We first visited the Dunka Pit iron mine near Babbitt, MN. The mine exposes Biwabik BIF that has been contact metamorphosed by Duluth Complex mafic igneous rocks. Our next destination was the scenic North Shore of Lake Superior, where we observed the Palisades Rhyolite at Shovel Point and fabulous anorthosite at Carlton Peak near Temperance River State Park.

The prevailing theme of the following day was lots of driving and lots of interesting geology. The group made a brief stop at an amethyst mine soon after crossing into Canada. The mineralization was fantastic, but the somewhat peculiar owner would have charged us for every step we took if he could have. Other highlights of the day were Neoproterozoic alkalic igneous rocks of the Coldwell Complex and a great hike at Schreiber beach.

The following day, the group awoke to a relatively heavy and cold rain. Fortunately we spent the morning underground



Geology 916 field trippers on spectacular Soudan banded iron formation near the Soudan Mine, northern Minnesota. From left to right: John Valley, Jade Star Lackey, Sarah Henry, Beth Valaas, Steve Beyer, Jake Eaton, and John Hora.

at Williams Mine at Hemlo, Ontario. The mines at Hemlo provide close to 50% of Ontario's gold and are hosted in a strongly deformed Archean greenstone belt. Our mine tour was provided by Gord Skrecky of the Williams Mine. Our afternoon was spent with Ontario Geological Survey geologist Ann Wilson. Ann gave us a fabulous tour of outcrops exposing Archean diamondiferous and mantle xenolith-bearing lamprophyre. Ann's upbeat personality kept us inspired in spite of heavy rain during the afternoon. The evening was spent under a tarp and drying out at Lake Superior Provincial Park.

By some miracle the group awoke to a beautiful sunny morning. We once again met OGS geologist Ann Wilson for a tour of the Wawa Greenstone Belt. Ann provided access to locations such as Sir James Dunn Pit that exposes the Eleanor siderite iron formation and unique framboidal graphitic shale, and Lucy pit that exposes the Lucy siderite iron formation. Additional Archean rocks were examined in a several square kilometer "fume kill" area that has little vegetation due to siderite smelting at Wawa.

The group next traveled east to examine outcrops related to the Kapuskasing Structural Zone near Chapleau, Ontario. The sunny day was spent observing Archean metasedimentary rocks, gabbroic anorthosites, and granitoids at various metamorphic levels in generally small exposures scattered along logging trails in the middle of the northern Ontario wilderness.

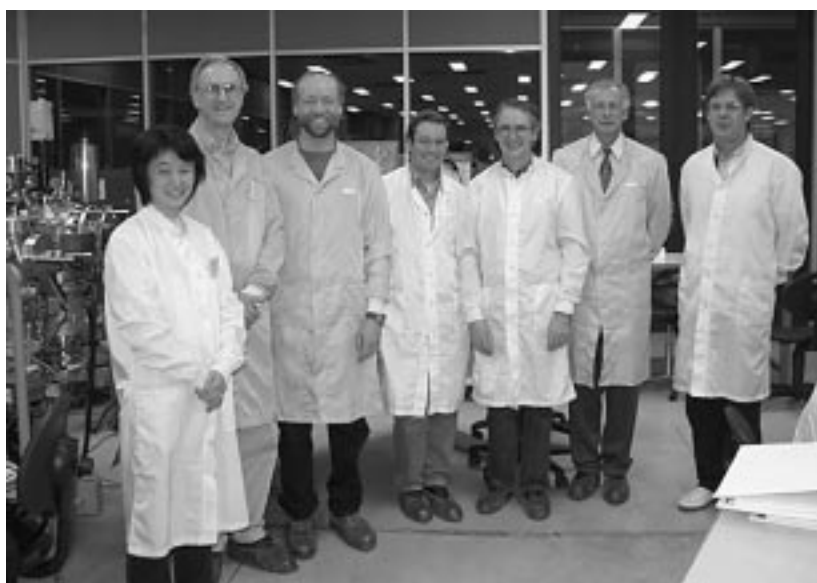
After once again waking to wind-driven and tent-saturating rain, the group traveled south to examine exposures of the Paleoproterozoic Huronian Supergroup sedimentary rocks on Lake Huron's north shore. We observed well-known glaciogenic Gowganda Formation in roadcut exposures, and the uranium-bearing Matinenda quartz pebble conglomerate at the reclaimed Pronto Mine. The wet spring weather turned our

logging road access into a miniature stream in which our van became badly stuck. The hour-and-a-half spent digging the van out turned into Black Fly Purgatory as the clouds lifted and the sun awoke the miserable creatures. The group crossed the border into the U.S. that afternoon and spent the night camping in Michigan's Upper Peninsula.

Yet another cloudy and cold day greeted the group the next morning. The geological focus for the day was Mesoproterozoic metasedimentary rocks of the Marquette Supergroup. We visited the stromatolitic Kona Dolomite near Marquette, MI, and the Negaunee BIF at Ishpeming, MI. The Negaunee BIF was particularly well-exposed at Jasper Knob in Ishpeming and displays "jaspilite" facies typified by alternating bright red jasper and gray hematite. The group then visited contact metamorphosed Negaunee BIF at several mine dumps and the non-active Republic Mine in Republic, MI. The beautiful specular hematite-rich BIF inspired the group to collect a sample for the department courtyard at an abandoned 19th century excavation trench near Republic.

The final day of the trip was spent in Michigan's Keweenaw Peninsula. Our geologic focus was the native copper mineralization of the area. Despite steady rain, several mine dumps were visited and yielded samples bearing native copper, epidote, calcite, and chrysocolla. Our drive back to Madison included a stop to observe the Archean Watersmeet Gneiss that contains 3.6 Ga zircons.

Despite nasty weather, the trip was a huge success. The group was able to visit "once-in-a-lifetime" exposures and an extremely wide variety of sedimentary, igneous, and metamorphic rocks. Many thanks are due to John Green, Dean Peterson, and Ann Wilson and all the other people who provided insight and access to the geology we desired to study.



December in Paris—The Wisconsin Ion Microprobe team visited the CAMECA factory: Left to right are Noriko Kita, John Valley, and Neal Lord, with CAMECA executives and technicians. The Wisconsin group went to test the IMS-1280 before it was shipped to its new home in Weeks Hall.