

# Banded Iron Formation Field Trip

Students in the Field

## With interplanetary luggage

by Jason Huberty

Twelve astrobiologists from the UW-Madison Department of Geology and Geophysics traveled to northern Minnesota and Thunder Bay, Ontario from May 19-24, 2008 for a terrestrial field trip. We set out to observe the rocks of the Gunflint Iron Formation in Ontario and the correlative Biwabik Iron Formation in Minnesota.

The over-arching goal of astrobiology is to understand the origin and evolution of life in the universe.

The earth sciences play a major role because our most accessible natural laboratories include Earth and Earth-like planets such as Mars. While Mars was outside of our travel budget, we did field test a suitcase X-ray diffractometer for NASA's Mars Science Lab mission.

We began our trip along the north shore of Lake Superior examining Keweenaw rocks of the 1100 Ma Midcontinent Rift System. At Gooseberry Falls State Park, we looked at amygdaloidal flow tops within the North Shore Volcanics. Later, we stopped at Split Rock Overlook, famous for its lighthouse



Hill Street, Thunder Bay, Ontario, tsunami deposit. The field XRD suitcase was a big hit wherever we went. Here we analyze clay minerals from devitrified volcanic glass.

that sits atop a large anorthosite inclusion. In the early 1900s, the company, 3-M, mined the anorthosite for abrasives thinking it to be corundum. This got a big laugh out of the group. Our next stop was Temperance River State Park—ironic for a group of geologists. We walked down to the bottom of the cliffs and saw pahoehoe, a red, oxidized ropy flow top, very close to the churning spring melt waters gushing into Lake Superior.

The group crossed the Canadian border and camped in Kakabeka Falls Provincial Park outside of Thunder Bay, Ontario. Kakabeka

Falls, known as the Niagara of the North, has a number of waterfalls including a spectacular drop of more than 40 meters that has eroded through the upper part of the Gunflint Iron Formation. On our first day in Canada, we surveyed a complete drill core of the Gunflint at the Ontario Ministry of Northern Development and Mines Core Library. We traveled up section over the next two days. Spectacular ribbon cherts and stromatolites overlain by carbonate grainstones are seen in the lower units of the Gunflint. The group especially enjoyed going to the microfossil outcrop at Kakabeka Falls Provincial Park where in 1954, Stanley Tyler (UW 1924-1963) first

demonstrated the existence of Precambrian life at 1850 Ma (picture, opposite).

Grainstones were a theme of the trip as we saw in the days to come. Ankeritic grainstones with silicified stromatolites were well exposed at the Current River but buried by black shales just a few meters away. We proceeded into Thunder Bay and ate lunch at Hillcrest Park. Off the Lake Superior shoreline, we could see the Sleeping Giant Peninsula, one of the seven natural wonders of Canada. The peninsula is an outcrop of a Keweenaw age diabase sill. We saw many such sills topping the older

# Field Trip to Upstate New York

Students in the Field

## Paleo group explores historical locations in June

by Dana Geary

Several paleo students went with my daughters and me for a week of fossil collecting in upstate New York. We visited the Paleontological Research Institution's Museum of the Earth, which we highly recommend to anyone traveling near Ithaca. PRI Director Warren Allmon and Education Director Rob Ross both accompanied us in the field to see and collect from several classic Devonian Hamilton Group sites.

We were especially fortunate to have Tom Whiteley as our guide for two days. Tom is a highly regarded trilobite specialist and the author of *Trilobites of New York*.

We visited the Upper Ordovician Beecher Beds, north of Rome, NY. This outcrop was originally discovered in 1892, and is well known for its exceptional trilobites with soft tissues exquisitely preserved by pyrite replacement. Charles Beecher of Yale University published two papers in 1893



Tom Whiteley and MaryRuth Kotelnicki at the Walcott-Rust Quarry site.

describing trilobite limbs and a trilobite larval form from this site. Unfortunately, Beecher died unexpectedly in 1904 and the exact

Paleoproterozoic strata.

After a short drive through residential Thunder Bay, we came to a truly one-of-a-kind outcrop—a tsunami deposit caused by the Sudbury meteorite impact. The Sudbury impact happened 450 miles to the east and 1850 million years ago. The ensuing basal surge and tsunami ripped up giant blocks of iron formation and chopped-off the cabbage heads of stromatolites. These fragments were then cemented along with countless accretionary lapilli and melt globules in this most unusual conglomerate. The date 1850 Ma is important as it marks the time of the Sudbury impact, the end of Lake Superior type Proterozoic banded iron formations, and possibly the transition to a sulfidic ocean. At a highway outcrop, the group collected our own samples of the impactite including a very large piece that will be featured in the Geology Museum's new astrobiology display.

On our third day in Canada, we continued up section into the overlying Rove Shale. At an abandoned nickel prospect, we studied a large cliff exposure that showed cycles of prodelta turbidite progradation alternating with carbonaceous-pyritic shale representing delta lobe abandonment. Returning to Minnesota, we examined the Archean geology of the



**Kakabeka Falls Provincial Park: Gunflint Microfossils Discovery Outcrop of Tyler and Barghorn. Back: John Valley, Brian Beard, Andy Czaja, Ian Orland, Clark Johnson, Shanan Peters, Huifang Xu, Phil Fralick and Marnie Demand. Front: Rafael Perez, Jason Huberty, Amalia Doebbert, Reinhard Kozdon and Dayi Ortiz.**

Vermilion district. We saw classic 2700 Ma pillowed greenstone, the Burntside fault, a splay on the eastern end of the Vermilion fault that extends to North Dakota, amphibolite grade migmatites, and ate lunch at the International Wolf Center. In the afternoon, the group studied the spectacularly laminated BIF at Soudan Underground Mine State Park and took the underground tour of rocks and the massive 10,000 ton MINOS neutrino detector.

On the last day of our fieldtrip, we toured the Mesabi Iron Range. The Biwabik Iron Formation in Minnesota is correlative with the

Gunflint Iron Formation in Ontario. The Duluth Complex truncated these BIFs and has metamorphosed the Biwabik to pyroxene hornfels. We started off at the United Taconite Pit where we were able to see the Lower Cherty and Lower Slaty members of the Biwabik. We ate lunch at Mineview in the Sky and then proceeded to Northshore Mining's Peter Mitchell Mine. At this mine, the Upper Cherty and Upper Slaty members of the Biwabik were exposed and we could see firsthand the extensive effects of metamorphism by the Duluth Gabbro. We ended the long day with stromatolites and a beautiful sunset.

After our week in the Precambrian, it was time to return home and to younger rocks. The group was tired in

body but energized in spirit, and it is a fieldtrip none will soon forget. We have archived a selection of photos on the Astrobiology home page on the department's website under the tab "Terrestrial Field Trips" ([http://www.geology.wisc.edu/astrobiology/field\\_trips/BIF\\_trip08/](http://www.geology.wisc.edu/astrobiology/field_trips/BIF_trip08/)) and invite you to take the virtual trip with us. Everyone involved with the trip would like to thank the alumni and donors to the Student Field Experiences Fund very much for making this trip possible and for the continued support of field trips in general. ●

whereabouts of this important site were lost. Tom Whiteley searched indefatigably for the site for many years until finally rediscovering it in 1984.

Tom also accompanied our group to the Walcott-Rust Quarry near Trenton Falls, NY. This Upper Ordovician locality is also well known for its diverse and well-preserved trilobites. The locality was discovered in 1870 by 20-year old Charles D. Walcott. Walcott's careful thin-sectioning of specimens from this quarry led to some of the very first identifications of trilobite soft parts, including gills, legs, and antennae. Walcott sold his specimens from this quarry to the Museum of Comparative Zoology at Harvard University. Louis Agassiz, the MCZ's director, later convinced Walcott to pursue a career in paleontology (leading eventually to the discovery of the Burgess Shale). Tom Whiteley learned about the Wal-

cott-Rust quarry while examining Walcott's specimens at the MCZ. One hundred years after the quarry was discovered, Tom reopened the site, which continues to yield important finds.

Aside from the great fossils, we really appreciated the historical aspects of the sites we visited. Special thanks to those who made this trip possible through their donations to the Field Experiences Fund. ●



**The paleo group at the Beecher Beds: George Rothdrake, Stan Koziarz (landowner), Carrie Levitt, John Koziarz (landowner), Markus Martin (fossil collector), MaryRuth Kotelnicki, Dana Geary, Sarah Bleiweiss, Molly Bleiweiss, Laura Mitchell, Una Farrell (Yale grad student), Erik Hoffmann, Ellen Whiteley. (Tom Whiteley)**