2007 Annual Meeting Information

Field Trips

Trip #1: Geology and Glacial Lake Shoreline Features of Mackinac Island
One Day Trip
Pre-Meeting, Saturday, October 6, 7:30 am to 5:30 pm

Mackinac Island represents one of the best exposures of late Silurian and early Devonian rocks in the Michigan Basin. The Island contains the best exposures of the Mackinac Breccia in the Straits of Mackinaw area. Dissolution and removal of salt (halite) from within the Silurian Pointe aux Chenes formation allowed for collapse of overlying limestone, dolomite, and shale, forming columnar breccia pipes. Percolating groundwater gradually cemented the collapse breccias. Recent emergence (due to uplift, glaciation, and isostatic rebound) has brought the rocks to the surface, where differential erosion has sculpted the breccias into the forms observed on the island. The effects of coastline erosion are recorded in wave-cut cliffs and abandoned beaches. The Island offers an excellent opportunity to examine shoreline features related to the glacial Lakes Algonquin and Nipissing formed at the edge of the receding continental ice sheets of 10,000 to 12,000 years ago. This trip will visit all prominent rock exposures (including sea stacks, sea caves, sea cliffs, arches, and abandoned beaches), and will provide an opportunity to examine and discuss the method of formation of the Mackinac Breccia.

Access to the Island is by commercial ferry service. Since automobiles are not permitted on the Island, the trip will be via bicycles. The bicycle trip is anticipated to take approximately six hours, and will involve a ride of 12 to 16 miles with a total of 10 to 12 stops. This trip will leave from the Park Place Hotel in Traverse City at 7:30 am and return at 5:30 pm on Saturday, October 6. An optional upgrade from the single speed bike is possible at your own cost; the standard fee for the single speed bikes is included in the trip cost.

Trip #2: Limestone Quarries and Fossil Collecting, Charlevoix, Michigan
One Day Trip
Tuesday, October 9, 7:30 am to 5:30 pm

This trip will examine the rocks of the middle Devonian Traverse Group, composed of carbonate and shale sequences. This trip will visit the St. Mary's Cement quarry near Charlevoix, Michigan, as well as outcrops outside the quarry. Field trip stops will examine several formations within the Traverse Group, and allow observation and collection of the abundant fossils within these rocks. The official stone of the State of Michigan is the "Petoskey Stone" (*Hexagonaria percarinata*), and this colonial coral is found in abundance in this region of the state. Other fossils, including trilobites, ostrocods, pelecpods, bryozoans, crinoids, brachiopods, and corals can be found in the Traverse Group rocks. This trip will leave Traverse City at 7:30 am and return at 5:30 pm on Tuesday, October 9.

Trip #3: Glacial Geology/Sleeping Bear Sand Dunes
One Day Trip
Wednesday, October 10, 7:30 am to 5:30 pm

This field trip will examine the late Wisconsin glacial deposits, as well as Holocene modifications to those deposits, of the northwestern lower peninsula of Michigan, including Sleeping Bear Dunes National Lakeshore. The dominant landforms in this area are from the glacial advance of the Greatlakean stadial (~11,800 radiocarbon years B.P.) and from reshaping the land by post-glacial processes, especially glacial Lake Algonquin 10,300 years B.P. and dune formation after 5,000 years B.P. Much of this area is a drumlinized upland covered by a reddish diamict. Structures within this unit and its relationship to the underlying sand and gravel deposit will be

examined. To the south of this area is a large pitted outwash plain with an impressive boulder-gravel component. The entire coastal area has been scribed by shoreline processes of proglacial Lake Algonquin. Wave-cut bluffs, beaches, and huge spits (up to 3 km long) overlie the glacial deposits. The spits contain untapped reserves of very well-sorted gravel. We will also visit one of three large dune complexes in this area. All three started developing via climatic cycles of activation and stabilization after the rise of post-glacial Lake Nipissing. Shoreline processes during the last 2,000 years have also closed off many embayments in a series of ridges and swales related to cyclical shifts in lake level. An overview stop will review the embayment process. This trip will leave Traverse City at 7:30 and return at 5:30. Wednesday October 10.

Trip #4: Tilden/Empire Mine, Palmer, Michigan
Two-day Trip
October 11-12, 7:00 am Thursday to 5:30 pm Friday

This two-day post-meeting field trip will visit the active iron mining region of Marquette County, Michigan. Two mines, the Tilden and the Empire, began production of pelletized iron concentrates in 1963 and 1974, respectively. Both mines are developed in the Early Proterozoic (+/- 2.0 billion years) Negaunee Iron Formation. The origin of the iron minerals in the Negaunee Iron Formation is a complex combination of primary sedimentary depositional, diagenetic, and metamorphic processes. The Tilden and Empire mines are located in close proximity to each other, and are both operated by Cleveland Cliffs, Inc. Together, the two mines are capable of producing 13.5 million tons of processed iron concentrate pellets annually. This trip will visit one or both operating open-pit mines to examine the structural and stratigraphic features of the iron ore bodies, and the implication of these geologic features in mine planning and ore control. Also included in the trip will be a tour of the iron ore pelletizing process, which entails milling the mined ore, separation of the iron, and production of high-quality iron ore pellets. Stops will also include examination of the disposal of mine tailings and waste rock. Time permitting; outcrops of the Marquette Range Supergroup (which includes the Negaunee IF) will be visited, as well as visit to the Michigan Iron Industry Museum.

The trip will leave Traverse City at 7:00 am on Thursday, October 11, and travel to the Tilden/Empire mine near Ishpeming. Following the mine trip, the group will stay at a local motel, and possibly visit the Michigan Iron Industry Museum that evening. The following day we will return to the mine for a tour of the processing facility, followed by one or two local stops before heading back to Traverse City. Arrival time back in Traverse City is estimated to be 5:30 pm on Friday, October 12. Motel costs are included in the cost of the trip.