FIELD COURSE OBJECTIVES
This field course provides advanced field training for professional geologists seeking to develop or hone their mapping, observational, and interpretive skills that are best suited to field studies of mafic layered intrusions. The camp will involve mapping exercises focused on two MLI that occur in northeastern Minnesota and are part of the 1.1 Ga Midcontinent Rift.

Specific skill sets to be taught during this course include:

**Mapping Skills**
- constructing useful field base maps
- neatly and accurately recording field information on field maps and in notebooks
- packing necessary field equipment
- developing navigational, logistical and safety skills necessary to maneuver through boreal forests of the Canadian Shield

**Observational skills**
- field identification of mafic minerals and their alteration products
- recognition of cumulate textures
- recognition and accurate measurement of internal structures (layering and foliation)

**Interpretive Skills**
- integrating field data with geophysical, geochemical and drill core data to make reasonable geologic interpretations
- using that same integrated database to evaluate the potential for PGE reef mineralization

COURSE INSTRUCTORS
Jim Miller – Assoc. Prof, UMD (33 yrs field mapping MLI in NE Minnesota)
Dean Peterson – VP Exploration, Duluth Metals (25 years field mapping & exploration throughout North America)
George Hudak – Director, Minerals Group, UMD/NRRI (25 yrs field mapping & exploration in Canadian Shield)

All three are principal instructors for the PRC’s Precambrian field camp, a six-week, summer field course for undergraduate geology students, held in NE Minnesota since 2007.

REGISTRATION
Registration for the complete field course is limited to 20 participants with preference given to PRC members.*

Field Course Registration

*4200 before 8/30/13

*4700 after 8/30/13

Includes all lodging, meals, field transportation, mapping supplies, and course material.

*To learn about PRC membership visit [www.d.umn.edu/prc/membership](http://www.d.umn.edu/prc/membership)
WORKSHOP SCHEDULE
The core activity of the field course will involve six days of detail bedrock mapping in the two layered intrusion areas. Participants will work in small field parties (2-4) and will produce basic geologic maps and mineral potential interpretations.

Sunday, Oct. 13 – Welcome, Introductions
5-6PM  Welcoming Reception (Inn on Lake Superior, Canal Park)
6-7    Banquet
7-9    Introductory Lectures

Monday, Oct. 14 – Layered Series at Duluth Mapping Exercise
8-10   Introductory Lectures (cont.)
10-5   Introduction to DLS field area, preliminary mapping
6-8    Group dinner at Canal Park establishment

Tuesday, Oct. 15 – Layered Series at Duluth Mapping Exercise
8-5    DLS mapping
5-8    Free time, dinner on own
8-10   Lab – DLS compilation

Wednesday, Oct. 16 – Layered Series at Duluth Mapping Exercise
8-1    DLS mapping
2-5    Lab-DLS compilation
5-6:30 Group dinner at Canal Park establishment
6:30-8 Preparation for Sonju Lake Mapping
8-10   Lab - complete DLS map

Thursday, Oct. 17 – Sonju Lake Intrusion Mapping Exercise
8-10  Drive to SLI field area
10-4  Group traverse of SLI stratigraphy
4-6   Check in at Wolf Ridge ELC; Dinner
7-10  Lab – feedback on DLS map, SLI compilation

Friday, Oct. 18 – Sonju Lake Intrusion Mapping Exercise
8-5    SLI mapping
5-7    Dinner at Wolf Ridge
7-10   Lab - SLI compilation

Saturday, Oct. 19 – Sonju Lake Intrusion Mapping Exercise
8-2    SLI mapping
2-4    Return to Inn on LS, Duluth
5-7    Group dinner at Canal Park establishment
7-10   Lab - complete SLI map; PGE reef targeting

Sunday, Oct. 20 - Final Presentations
9-12   Presentation of SLI mapping, PGE reef targeting
12-1   Lunch; End of Course

Geologic Setting of the Field Course Areas
The geology of northeastern Minnesota is largely composed of intrusive and volcanic rocks (Fig. 1) that formed during the 1.1 Ga Midcontinent Rift. A volcanic edifice of over 10 km of subaerial basalts and lesser rhyolite, termed the North Shore volcanics, accumulated on the northwestern flank of the rift trough, that is now centered over western Lake Superior. Multiple large sheet-like intrusions of mafic and felsic magmas that were emplaced into the basal part of the North Shore volcanics are collectively called the Duluth Complex. These intrusions are subdivided into four series based on their age, internal structure and dominant lithologies – Felsic Series, Early Gabbro Series, Anorthositic Series, Layered Series. The Layered Series is composed of about a dozen individual mafic layered intrusions. The best exposed of these, and the focus of the first half of this course, is the Layered Series at Duluth.

A suite of mafic to felsic intrusions emplaced into the more medial section of the North Shore volcanics is collectively termed the Beaver Bay Complex. Massive hypabyssal intrusions dominate the Beaver Bay Complex, but one notable exception is the well-differentiated Sonju Lake intrusion (Fig. 1). Mapping out the lithostratigraphy of this Skaergaard-like intrusion will be the focus of the second half of this field course.

Figure 1. Geology of Northeastern Minnesota showing the locations of the Sonju Lake Intrusion and the Layered Series at Duluth