Title: Mellen Gabbro

Location: Exposures along the east side of Hwy. 13 in SE¼, SE¼, SW¼, Sec. 30, T.45N., R.2W. Ashland County, (Mellen planimetric quadrangle.)

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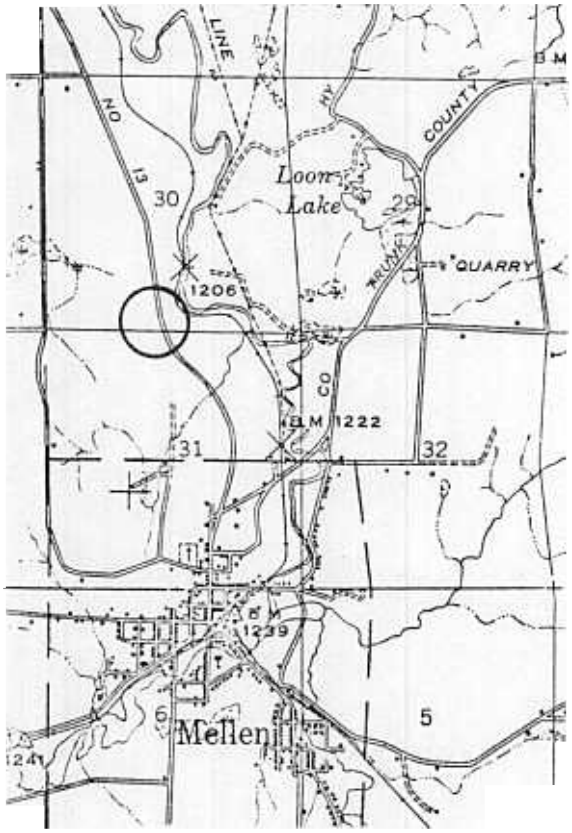

Description: The Mellen Gabbro is a large sill-like mass nearly 60 miles long. The Mellen granite divides the intrusion into two segments. The Mineral Lake intrusion is west of here -- west of the Mellen granite. The eastern complex exposed here is about 35 miles long and up to five miles thick. It was intruded near the base of the Keweenawan lava flows, approximately along the unconformity between the Keweenawan and the older Precambrian rocks.

Tabet and Mangham (in press) concluded that the eastern half of the Mellen complex was formed by three separate intrusions of basaltic magma. Each intrusive phase crystallized with an olivine-rich base and a plagioclase-rich top before intrusion of the next overlying sequence. Fractional crystallization and convection currents produced rhythmic layering in the olivine-rich basal portions (olivine gabbros and troctolites). The layered gabbro exposed in the outcrops here is part of the olivine-rich basal parts of one of the intrusions.

An anorthositic gabbro phase of the intrusion has been quarried about a mile east of here. Rock from these quarries have been marketed as "black granite," some of which was used in the construction of the "Eternal Flame" monument to J. F. Kennedy.

Significance: The Mellen Gabbro and associated lava flows and granite represent the last known igneous event in the Lake Superior region. The lava flows and associated sediments are believed to have formed in an opening rift that extended from Lake Superior southwestward at least to Oklahoma (Craddock, 1972). Igneous activity along the rift took place from about 1250 to 950 million years ago, and deposition of sedimentary rocks continued for an unknown length of time thereafter, forming the sandstones along the south shore of Lake Superior.

General geology and field trip stops, central and Gogebic
Geology in Wisconsin in part from Aldrich (1929)

From Schmidt & Hubbard, 1972

The compositional layering in the gabbro was probably nearly horizontal at the time of formation. Why? Using this assumption, Tabet and Mangham (in press) show that the lava flows were dipping only 10°-15° north at the time the gabbro was intruded. Radiometric age on the gabbro is approximately 1,000 m.y., and this must represent an early stage in the tilting of the south limb of the Lake Superior Syncline. As the central part of the syncline subsided, northward-flowing streams kept it largely filled with sandstones eroded from the surrounding highlands (Hamblin, 1961).

An extensive contact metamorphic aureole is present around the gabbro produced by the heat given off by the cooling magma. Metamorphic effects are most noticeable in the slates, graywackes, and iron-formations to the south, but the basalts into which the magma intruded are also highly metamorphosed near the gabbro. The metamorphism of the iron-formation increased the grain size and developed iron-amphiboles which inhibited the development of natural orebodies in this part of the Gogebic Range, but this increase in grain size and development of magnetite has rendered the iron-formation suitable for beneficiation as a taconite ore.

References:

Craddock, J., 1972, "Late Precambrian: Regional Geologic Setting": in Geology of Minnesota: A Centennial Volume, edited by Sims and Morey, Minn. Geol. Survey, pp. 281-291.

Tabet, D. E., and Mangham, J. R., (in press), The Geology of the Eastern Mellen Intrusive Complex, Wisconsin, Geoscience Wisconsin, Wis. Geol. Nat. Hist. Survey.