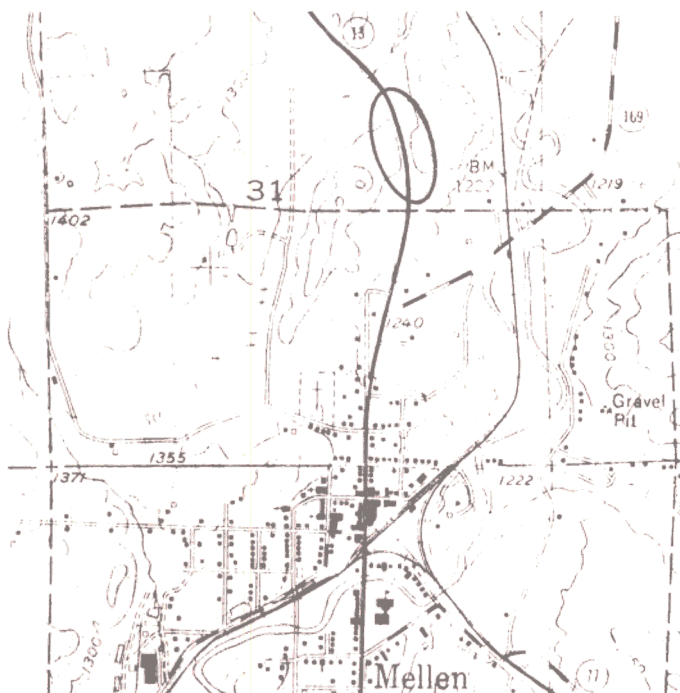


Title: The Mellen "Granite"

Location: West side of Wis. Hwy. 13, NE $\frac{1}{4}$, SW $\frac{1}{4}$, NE $\frac{1}{4}$, Sec. 31, T.45N., R.2W
Mellen 7.5 Minute Quadrangle, Ashland Co.

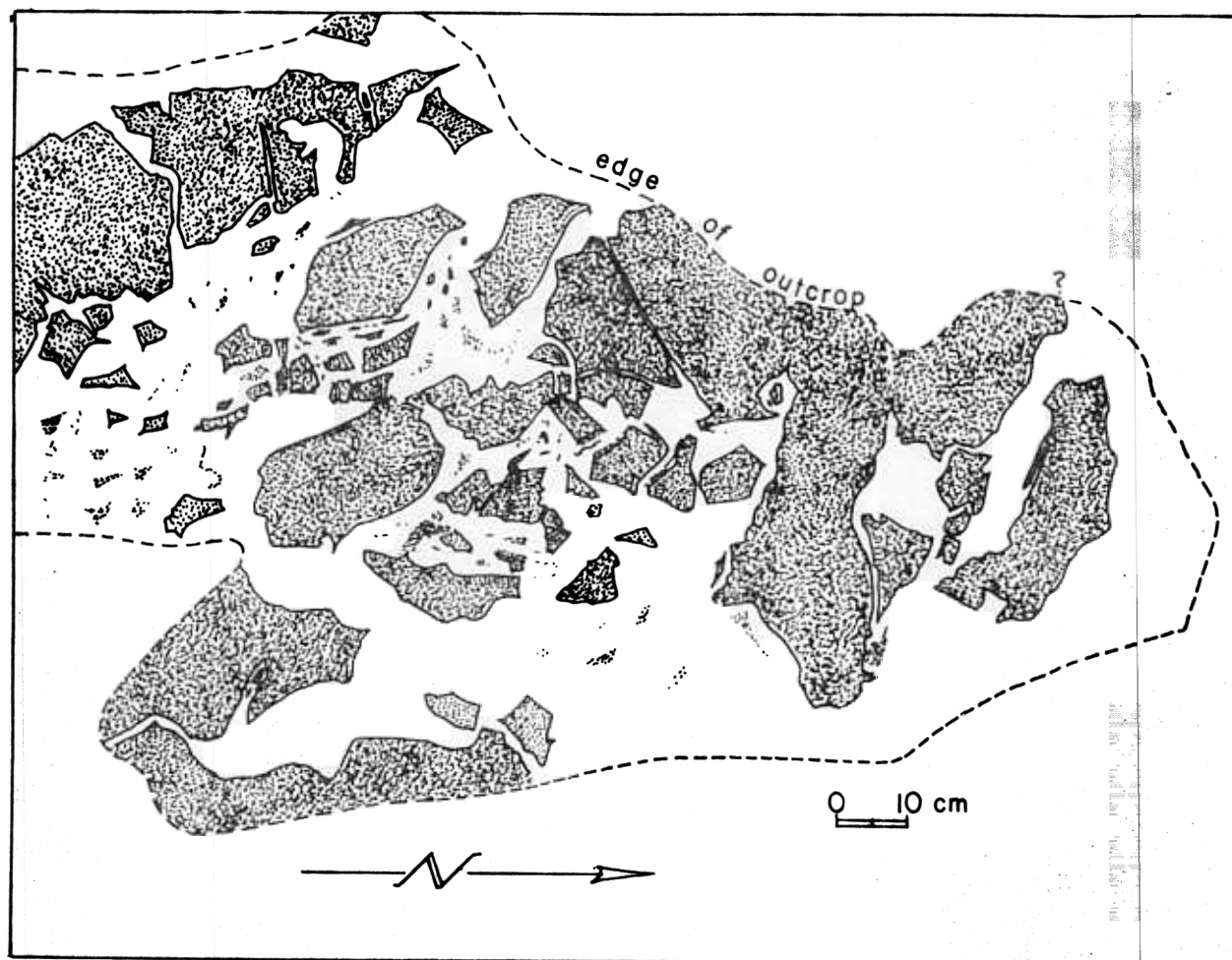


Author: Gene L. LaBerge

Description: This exposure is an excellent example of an intrusion breccia, with the light gray granodiorite containing numerous angular blocks (xenoliths) of darker gabbro and basalt. Breccias of this type are a result of magmatic stoping, wherein the rising magma cracks the overlying rocks, and magma is squeezed into the cracks, opening them wider. Finally, the opening cracks free large blocks of the overlying rock that fall into the rising intrusion. Xenolith rich portions such as we see here are typical of the border zones of intrusions.

The variety of lithologies in the xenoliths indicates mixing by flow during intrusion, which also produces alignment of the xenoliths. As shown in the sketch, some of the gabbroic xenoliths are extensively veined by the granite, suggesting that they were being segmented at the time the granite solidified. Some segmentation of the xenoliths probably occurred prior to incorporation in the magma. Further fragmentation may occur by attenuation of the fragments during flow of the highly viscous magma.

The exposure also illustrates differential weathering. The granitic rock stands about 1.5 cm higher than the gabbro, indicating that the mafic rocks here are more susceptible to chemical weathering. Note that there is no glacial polish, or pavement on this outcrop, yet about a half a mile south of here there are excellent glacial grooves and polish on outcrops of the Mellen Gabbro. The question arises, is the weathering here a post-glacial phenomenon? Or was there no glacial polish here originally? If the weathering is post glacial, then we have an opportunity to determine the rate of differential weathering since the ice receded from here some 9,000 years ago.



Sketch of intrusion breccia of the Mellen "Granite."
 White is granodiorite, dark blocks are gabbro and basalt.
 Note alignment and segmentation of blocks. (Sketch by
 P. E. Myers, UW-Eau Claire.)

Significance: The Mellen Granite is intrusive into the Mellen Gabbro and to some extent into the Keweenawan basalts that enclose the gabbro. Similar granodioritic intrusions are present south of Amnicon Falls near Superior (Mengel, 1969) and form extensive units called "redrock" associated with the Duluth Complex in Minnesota. Thus, the granodioritic intrusions are relatively widespread and are spatially related to gabbroic intrusions.

Radiometric age dating indicates that the granodiorite was intruded about 950 million years ago (Mengel, 1969), and thus represents the youngest known igneous event in the Lake Superior region. Although it is younger than, and intrudes the Mellen Gabbro, its close spatial relationship to the gabbro indicates that both magmas must have followed the same path to their present site. It is likely that the granodiorite is a late stage differentiate of the same parent magma that formed the Mellen Gabbro.

Mangham and Tabet (1978) conclude that the Mellen Gabbro was intruded during the early stages of folding of the Lake Superior Syncline. Since the Mellen Granite was intruded sometime after the gabbro body, it follows that it must have been intruded later in the deformational history. Thus, we may infer that the formation of the Lake Superior Syncline was well under way by 950 million years ago.

References:

Mengel, J. T. Jr., 1970, Geology of the Western Lake Superior Region:
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Intrusive Complex, Wisconsin: Geoscience Wisconsin, Wis. Geol. Nat.
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