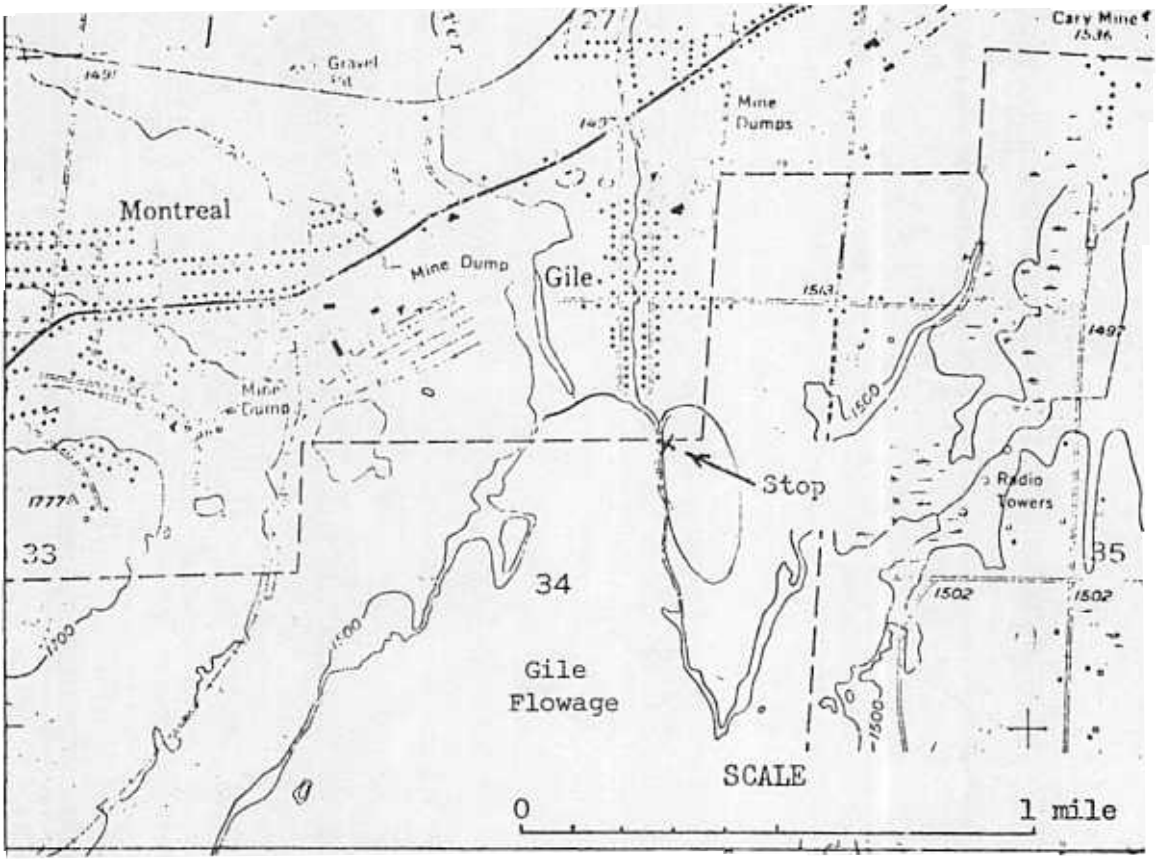
Title: Early Precambrian Greenstone

Location: South edge of Gile, Wis., SW¼, NE¼, Sec. 34, T.46N., R.2E. (Ironwood, Wis.-Mich. 15 Minute Quad.) (Gile Flowage)



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Description: A large area of outcrop is present on the hill along the east side of Gile Flowage. The main rock type is a metabasalt (or greenstone) along with several small intrusives. At the north end of the exposure the greenstone is a coarse tuff with spectacularly elongated fragments. Further south along the hill pillow lavas with unusually large pillows are exposed.

The marked elongation of the volcanic fragments has been produced tectonically, for they must have initially been roughly equidimensional. The style of deformation in the greenstones here is markedly different than that in the overlying sedimentary rocks, and therefore must represent an earlier deformation. This difference in style of deformation, along with abrupt changes in lithology, have long been recognized as indicating a significant age difference between the greenstones and granites and the sedimentary rocks (Irving and Van Hise, 1892). Question: What type of deformation produces the rod-like elongation exhibited in the volcanics here?

Significance: The greenstones here are similar to the metavolcanics that underlie much of the Gogebic Range. They consist mainly of pillowed and massive, steeply dipping basaltic rocks that have been metamorphosed only to the greenschist facies. Despite the intense deformation, the rocks retain well-preserved primary textures and structures. The granitic rocks that intrude the volcanic sequence are about 2700 m.y. old (Sims, 1976), and thus the volcanics must be older than that. The igneous and tectonic events represented by the greenstones and associated granites are perhaps the last rock-forming event in the Early Precambrian. After the formation of these rocks, the area was subjected to erosion for several hundred million years before the sea again advanced over the area and the Middle Precambrian sediments, including iron-formation, were deposited.

The common occurrence of pillow structures and water-laid tuffs in the greenstones (and associated graywackes) indicates that the rocks were formed in a submarine environment. However, the tectonic setting where greenstone "belts" were formed has been greatly debated (e.g. Annhaeueser, and others, 1969; Goodwin, 1968; Hutchinson, 1973) The generally low grade of metamorphism in the greenstones, except adjacent to intrusions, argues against the greenstones and granites being rootsof former mountain ranges. Also, the presence of greenstone belts of approximately the same age (2700 m.y.) covering large parts of the Canadian Shield (Morey and Sims, 1976) presents problems in explaining the tectonic setting in which the rocks formed.

The 2700 m.y. old greenstone-granite terrane extends only 10-20 miles south of the Gogebic Range in Wisconsin. South of that, Early Precambrian rocks are gneisses and amphibolites and are commonly more than 3,000 m.y. old (Sims, 1976). The origin of these different rock types and their relationship to one another is one of the major unresolved problems of the Lake Superior region.

References:

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