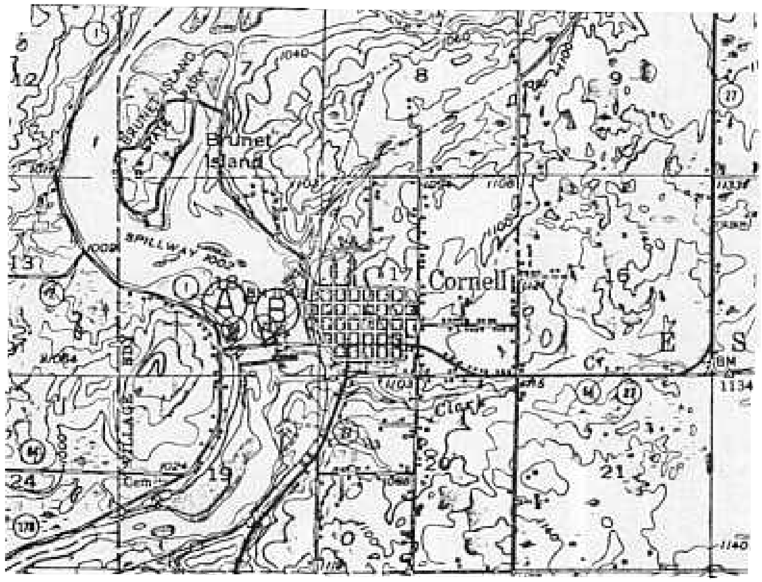
TITLE: Cornell Flaser Gneiss and Amphibolite

LOCATION: A, SE 1/4, NE 1/4, Sec. 18, T.31N., R.6W., west side of Hwy. 64 bridge
B, SW 1/4, NE 1/4, Sec. 18, T.31N., R.6W., east side of Hwy. 64 bridge



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SUMMARY OF FEATURES:

Flaser gneiss composed of mica, quartz, feldspar and sparse garnets is tectonically interlensed with thinly laminated fine-grained banded garnet amphibolite. Although granite, which became the flaser gneiss, was probably intruded into the amphibolite, its contact today is a shear zone.

DESCRIPTION--FLASER GNEISS, Loc. A

Garnetiferous, biotite flaser gneiss (Fig. 1) near water level at the northwest corner of the Cornell bridge is composed of coarse lenses of zoned feldspar in a micaceous mylonitic matrix. This rock contains more biotite and less garnet than flaser gneiss at Locality B. "Penetrative" deformation and cataclasis normally involve several stages of differential grain fracture, displacement, and ablation. The rock from which this gneiss formed was probably a coarse-textured biotite quartz monzonite. Each component mineral in a granitic rock behaves differently under shearing stress.

Stage 1--Protomylonite

Early strain is expressed as progressive microscopic crushing of minerals, first at corners, then on edges, and last on faces. The lens is an equilibrium form at all scales. Quartz is easily fractured and accumulates with fragmented feldspar as an insulating film of crushed rock or "mylonite" encasing relict feldspar lenses or "porphyroclasts". Such a rock is characterized by a faint foliation and ovoid shape of feldspars. Primary textures are still conspicuous.

Stage 2--Flaser Gneiss

With continued deformation, relict feldspar lenses become decidedly lensoidal (Fig. 2). Primary mica is reoiriented along interlensing slip planes, and the rock becomes conspicuously foliated. New mica may begin to crysallize at this stage. The proportion of mylonite to surviving grains increases while relict feldspar lenses become thinned by ablation. Crenulation or microfolding or residual rock lenses is common at this stage. "Tectonic xenoliths" or lenticular fragments of non-mylonitized rock are carried along in the flowing granular mass. Drag folds and ptygmatic folds show differential movement and turbulence. Most of the displacement becomes localized along thin, interlensing zones of slippage (Fig. 2).

Stage 3--Ultramylonite

Reduction of relict rock and mineral lenses by ablation may ultimately result in a thinly laminated, flinty ultramylonite, or in crystallization of new feldspar. Relict feldspar lenses become mantled by new feldspar. Reversed zoning is common. The rock at this stage becomes a blastomylonite. The point at which feldspar regrowth begins varies even from one part of an outcrop to another.

Reaction rates accelerate with: (1) increased surface area in accumulating mylonite. (2) frictional heat. and (3) pressure of mobilized water.

Anhedral form of the garnets and absence of deformation around them indicate their late-kinematic age. Fresh garnet is a relatively rare mineral in rocks of the Eau Claire region. Large, relict garnets at Big Falls are altered to hornblende. With rocks that have been deformed and metamorphosed at least three times, it becomes difficult to discriminate between surviving "relict" minerals and those produced during later metamorphism.

Foliation and compositional layering in rocks at Cornell strike N80°E to N80°W. These same structural elements at Fisher River 4 km northeast of here trend N40°-50°E, a factor taken to indicate a major flexure in the rocks north of Cornell.

GARNET AMPHIBOLITE, Loc. B

Laminated garnet amphibolite at Location B is representative of the "Cornell amphibolite" which crops out almost continuously for 4 km down the Chippewa River. Banding in the amphibolite is cur by lenticular segments of granite and quartz veinlets. The nearly vertical banding is

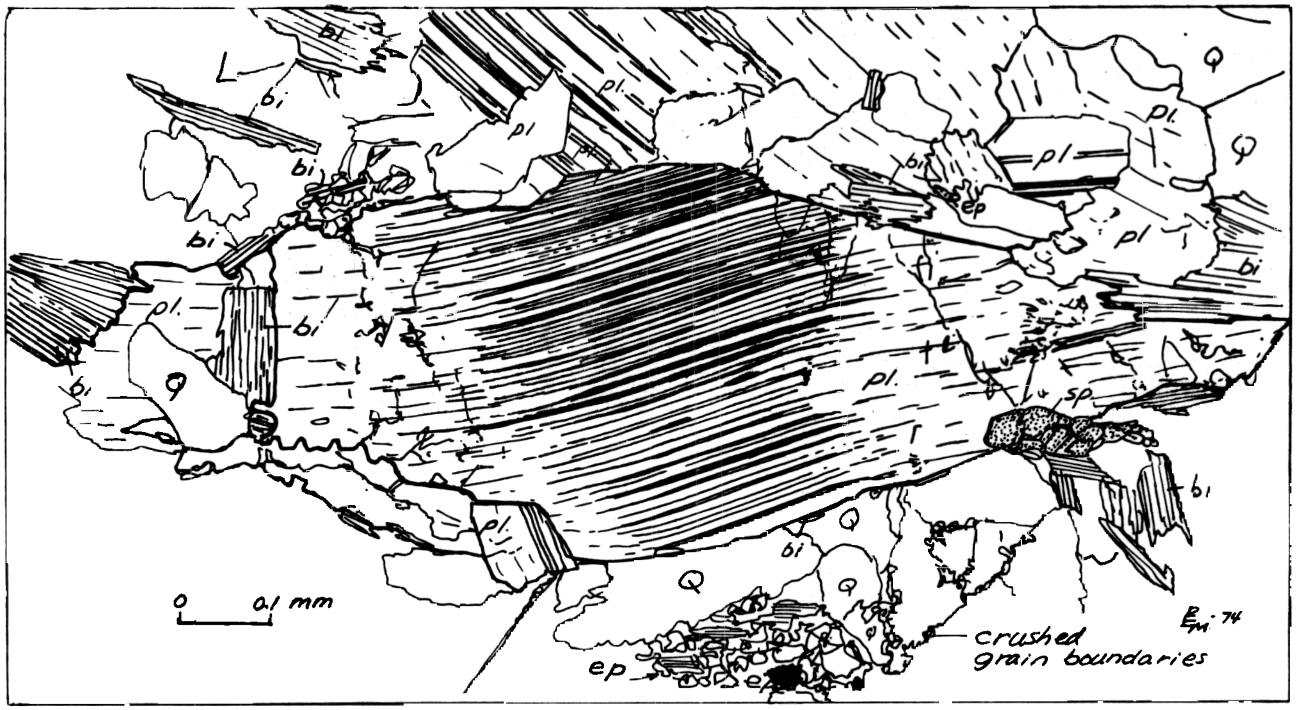

Figure 2 -- Bent and lenticulated plagioclase in feldspathic orthogneiss from Hamilton Falls. Biotite shows spatial affinity for slip planes enveloping the plagioclase lens. Some plagioclase grains show destruction of albite twinning owing to small-scale disordering of crystal lattices.

thinly interlensing in 3 dimensions, and strikes N80°E to N80°W. Small, isoclinal folds plunge at low angles in the plane of compositional banding. Garnets in the amphibolite tend to be randomly clustered and have ragged borders. No evidence of garnet porphyroblast rotation was seen. The distribution of garnet clusters shows little relation to banding or fold morphology. The garnets appear to have formed after most of the particulate flowage of the rocks, as evidenced by the good preservation of garnet crystal apophyses in the amphibolite.

Coarse, garnetiferous felsic flaser gneiss and sheared pegmatite are in contact with amphibolite in this outcrops. Granite commonly intrudes amphibolite at other locations (Jim Falls). Intrusive relations of most granite bodies in the area are obliterated by shear displacement and partial recrystallization. The occurrence of garnet in the flaser gneiss indicates that both rocks were metamorphosed after tectonic imbrication.

Figure 2 -- Flaser gneiss from Loc. A Relict feldspar lensoids are enclosed in a matrix of micaceous mylonite.