

Origin of the gold-hosting porphyry at Geraldton, Ontario

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The lithologic unit known as the “porphyry” at Geraldton, Ontario is host to widespread gold mineralization, but its origin is poorly understood. The porphyry unit occurs within the Beardmore-Geraldton greenstone belt in the Superior Province of the Canadian Shield. Samples from the porphyry unit contain approximately 1 mm porphyroclasts of plagioclase within a groundmass composed of approximately 0.1 mm quartz, plagioclase, and muscovite grains. The plagioclase porphyroclasts commonly have asymmetrical tails and muscovite crystals tend to bend around the porphyroclasts. Undulose extinction and subgrain boundaries indicate dislocation creep in quartz. Plagioclase commonly contains deformation twins. The porphyry unit also has a well-developed foliation defined by parallel alignment of muscovite. Based on microstructural analysis, it appears that the most likely protolith for the porphyry unit is a felsic plutonic rock. The microstructures are typical of a mylonite. The porphyroclasts give a minimum original grain size of approximately 1 mm for the protolith. Approximately 30 km east of Geraldton, near Longlac, Ontario, is a 150 km² elliptical, granitic intrusion called the Croll Lake stock. This intrusion is the nearest felsic plutonic rock to the porphyry unit at Geraldton and is also deformed. Deformational features in quartz include undulose extinction, subgrains and serrated grain boundaries. Plagioclase commonly contains deformation twins. Evidence for deformation of the Croll Lake stock intensifies toward its margins where it resembles the porphyry unit. Microstructural analysis of the porphyry unit and the Croll Lake stock suggest that the porphyry unit is a mylonitized fragment of the Croll Lake stock.