"Crack-Seal" Veins in Meguma Lode Gold Deposits: Hydraulic Fracturing or Replacement Phenomenon

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Auriferous quartz veins hosted by Lower Paleozoic turbiditic sediments of the Meguma Group have produced in excess of 1,000,000 oz. of gold from approximately 60 districts. Essentially all of this production has come from shallow development (<300 metres) between 1860-1940 using antiquated mining techniques.

Numerous vein types occurring at all gold deposits exhibit differing morphology, texture, mineralogy and relative age which, in many areas, can be related to the variability of local wall-rock texture and composition. Most veins display complex, composite textures which suggest episodic fluid emplacement along structurally favorable dilatant zones. Of these, the most problematic of the vein types, in terms of genesis, are the "crack-seal" or "laminated" quartz veins which carried much of the recovered historical gold. Recently, separate studies have suggested several distinct mechanisms for their origin, including:(i) syn-sedimentary siliceous oozes; (ii) pre-fold, hydraulic fracture filling induced by high pore-fluid pressure and (iii) variable wall-rock replacement. The absence of any convincing evidence of syn-sedimentary vein formation severely limits the first theory, while relative structural age relationships suggesting that stratigraphy was locally upright prior to initial vein formation raises problems with regards to the second hypothesis.

Underground geological mapping of the Beaver Dam gold deposit suggests that relatively constant stratigraphic thickness is maintained regardless of the amount of vein material present. In some greywacke beds, irregular granular-textured quartz veins are formed by wall-rock replacement representing the end products of extreme silicification. In slate lithologies, vein textures are generally dominated by either massive, crystalline white quartz, "crack-seal" laminated type quartz or a combination thereof. It is not uncommon to observe replacement veins in greywacke interconnecting with "crack-seal" type veins in adjacent slate beds, but in such cases relative age relationships become obscured. Because no significant thickening in the stratigraphy occurs in areas of quartz veining, we conclude that "crack-seal" type veins are formed in part or in whole by selective wall-rock replacement. Petrographic studies of these vein types lend corroborating evidence and indicate that the fine, dark laminae typical of these veins are stylolitic in nature. As the model proposed herein predicts, the laminae in the "crack-seal" veins represent the most insoluble wall-rock residue.