Embayed Volcanic Quartz: A Product of "Cellular Growth" Rather Than Resorption

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Textural evidence from felsic volcanic rocks of the Late Devonian (previously Early Carboniferous) Piskahegan Group, in southwestern New Brunswick suggests that embayed quartz phenocrysts were originally optically-continuous, microglomerocrysts that subsequently coalesced. Examples of crystals with embayed faces, but with crystal corners intact, show that resorption did not occur. Furthermore, there are optically continuous quartz glomerocrysts with deep embayments and/or patches of groundmass between the constituent crystals. These glomerocrysts are clearly a growth feature. If growth had continued the polycrystalline nature of the glomerocrysts would have been obliterated leaving large crystals with embayments and/or inclusions filled with groundmass material.

Optically-continuous quartz glomerocrysts strongly suggest the crystallographic orientation of their constituent crystals was pre-determined by magma structure. In other words, the magma was strongly polymerized such that "liquid crystal" domains existed within it. Embryonic crystals or "cells" nucleating within such domains would have had the same optical orientation, and the greater the number of cells, the more likely they would have coalesced. This is because a single large crystal has a more energy-efficient surface to volume ratio than several small ones comprising the same volume.