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Ivan A Blank* (blanki@wpi.edu), 1 Cedar Street #32, Worcester, MA 01609, and **Marianne K Korten** (marianne@math.ksu.edu) and **Charles N Moore** (cnmoore@math.ksu.edu). *The Hele-Shaw problem as a "Mesa" limit of Stefan problems: Existence, uniqueness, and regularity of the free boundary.*

We study a Hele-Shaw problem as a "Mesa" type limit of one phase Stefan problems in exterior domains. We study the convergence, determine some of qualitative properties of the unique limiting solution, and prove regularity of the free boundary of this limit under very general conditions on the initial data. Indeed our results handle changes in topology and multiple injection slots. (Received February 07, 2006)