

1129-35-303

**Hector A Chang-Lara\*** ([changlara@math.columbia.edu](mailto:changlara@math.columbia.edu)), Department of Mathematics  
Columbia University, Room 509, MC 4406 2990 Broadway, New York, NY 10027, and **Nestor  
Guillen.** *From the free boundary condition for Hele-Shaw to the fractional parabolic equation.*

We propose a method to determine the smoothness for the free boundary of sufficiently flat solutions of one phase Hele-Shaw problems. The novelty is the observation that under a flatness assumption the free boundary—represented by the hodograph transform of the solution—solves a nonlinear integro-differential equation. This nonlinear equation can be linearized to a (nonlocal) parabolic equation with bounded measurable coefficients, for which regularity estimates are available. (Received March 19, 2017)