

Free Boundary Problems: Common aspects and methods

Luis Caffarelli (Texas - Austin)

Abstract :

We will discuss several mathematical problems exhibiting the formation of free boundaries, and develop some tools and structures to approach them.

Content:

1: Some basic tools: Properties of solutions to diffusion processes: second order equations in divergence and non divergence forms, variational and Perrons (viscosity methods) for second order equations. Interior and boundary Harnack inequalities for second order divergence equations.

2. a) The obstacle problem: optimal regularity and non degeneracy, blow up methods, free boundary regularity, similarities with the theory of boundary regularity for sets of minimal perimeter (minimal surfaces) b) Cavitation type problems: non-variational approach, minimal solutions, optimal regularity and non-degeneracy, a "Harnack inequality" approach: Lipschitz free boundaries are smooth.

c) The Signorini problem (a non-local obstacle problem): Description of the problem, basic properties of the solution, regularity properties, some monotonicity properties, free boundary regularity.

3: Recapitulate, informal discussion of topics and problems