

Regularity in free boundary problems

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Free boundary problems cover a wide class of nonlinear problems for partial differential equations and have applications in science, industry, medicine and economics. The problems with free boundaries describe processes with possible jumplike changes. Moreover, it is apriori unknown at what time and where such a jump happens. Typical here are the processes with phase transitions in the medium, the phenomenon of hysteresis, the biological processes related to the population dynamics. Some models of financial markets can be also considered as free boundary problems.

In this talk we discuss the methods, developed in the last decades, for investigation the problems with free boundaries. These methods include scalings, various monotonicity formulas, study of global solutions, applications of ideas from the geometric measure theory and from the theory of nonlinear PDEs.