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Emergence of superconducting textures in two dimensions[1]
A. GLATZ, I. ARANSON, V. VINOKUR, Argonne National Laboratory, N. CHTCHELKATCHEV, Moscow Institute of Physics and Technology, T. BATURINA, University of Novosibirsk — Self-organized regular patterns are ubiquitous in nature, and one of their most celebrated manifestations is the Abrikosov vortex lattice: under an applied magnetic field, the homogeneous superconductivity becomes unstable and cast itself into a regular texture of the normal filaments, called Abrikosov vortices, immersed into a superconducting matrix. In this presentation I show that the interplay between the superconducting order parameter and elastic fields, which are intimately connected to the very existence of the superconductivity itself, can result in a novel superconducting state dual to the Abrikosov state: a regular texture of superconducting islands. The fact that both patterns emerge within the framework of the Ginzburg-Landau description of superconductivity indicates that the formation of regular structures may be a generic feature of any phase transition. Emergence of superconducting island arrays is not specific to the effect of the elastic forces, but can be caused by any inherent mechanism generating long-range non-local interactions in the Ginzburg-Landau functional. In particular, our findings suggest that the formation of superconducting island textures is a possible scenario for the superconductor-to-insulator transition in thin films. Additionally these self-organized regular arrays can be viewed as an array of coupled superconducting grains which from Josephson junctions. [see: arXiv:0910.0659]

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