Bernoullis Tafelrunde

Graduate Student Seminar

Monday, 14 March 2022, 12:15-13:00
Hybrid seminar
Seminar room 05.002, Spiegelgasse 1 / Zoom

Marco Inversi

University of Basel

How Do Oil And Water Interact?

Abstract

Take a glass of water and pour some oil inside. How can we describe this system at equilibrium? For some physical principle, the equilibrium corresponds to a critical point of some energy (that we can choose!). Indeed, this is a phase transition problem and some energy functionals can be proposed to describe this system. For example, it is natural to introduce a Ginzburg–Landau energy (of local or nonlocal type), namely an integral functional which is given by the sum of a potential term and a kinetic/interaction term. The problem of minimizing this energy has been widely studied and it is a classical topic in the Calculus of Variations. Looking at the Euler–Lagrange equation to this functional, we discover a deep connection with a famous conjecture of De Giorgi on level sets of solutions to the Allen–Cahn equation. These facts motivate beautiful results in the theory of Gamma-Convergence, starting by Modica–Mortola in the '70. I will try to describe in simple words and pictures some of the basic ideas behind this huge theory.