Talk-19

The motion of particles driven by surface energy on the boundary of smooth domain

Peter W. Bates
Michigan State University

Abstract

We consider particles described as peak-like solutions to a singularly perturbed nonlinear parabolic partial differential equation. Minimal energy stationary states were shown to exist by Ni and Takagi in a series of papers where detailed qualitative properties of these states were also derived. Taking the gradient flow of the energy functional leads to a nonlinear parabolic equation and it is natural to ask about the motion of particles as dynamic peak-like solutions away from equilibrium. By proving an abstract theorem about the existence of a true invariant manifold in the neighborhood of an approximately invariant, approximately normally hyperbolic invariant manifold, we are able to answer this question, giving the global dynamics of a particle on the boundary of a smooth domain. Questions concerning the dynamics of particles in the interior of the domain or driven by Cahn-Hilliard or other evolution laws may possibly be addressed by this approach.