



Einladung zum Oberseminar Mathematik in den Naturwissenschaften

Julius-Maximilians-Universität Würzburg
Lehrstuhl für Mathematik in den Naturwissenschaften

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Gradient-Flow Structure for Eulerian Elastic Bodies and Shape-Preserving Diffuse Interfaces

I will present two variational models, developed separately, aimed eventually at a common goal: a consistent description of an elastic body whose material boundary is represented by a diffuse interface, on a fixed Eulerian mesh.

The first model reformulates finite-strain elastodynamics using a reference map ξ , replacing the deformation tensor by $(\nabla \xi)^{-T}$ and reducing a tensor-valued transport equation to a vector one. A virtual-work derivation gives the elastic force through a cofactor identity. The transport equation for ξ requires regularization, and I will discuss under what conditions a regularization admits an energy-dissipation inequality: this holds when the added term is itself a gradient flow of the elastic energy, and does not hold in general otherwise.

The second model concerns the standard Ginzburg–Landau phase-field energy, whose gradient flows move the interface by curvature. This is the correct behavior when the phase field represents a physical surface tension, but is not appropriate when the phase field is instead a passive material label, which is the situation the first model leads to when the elastic body’s boundary is represented this way. Using the Modica–Mortola/Sternberg decomposition of the Ginzburg–Landau functional, I construct an alternative energy that retains only the profile-restoring part of the decomposition, and show that the resulting curvature-driven motion is suppressed by additional orders of the interface width, under both mass-conserving and non-conserving gradient flows.

Ort: Mathematik Ost, 40.01.003

Zeit: Mittwoch, 29.07.2026 um 14:00 Uhr

You are cordially invited to this lecture. Request the Zoom link from
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gez. Anja Schlömerkemper