Einladung

Würzburger Mathematisches Kolloquium

Julius-Maximilians-Universität Würzburg • Institut für Mathematik

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Giovanni-Prodi-Gastprofessorin im Sommersemester 2024

Variational Models in Material Science

Dienstag, 7. Mai 2024 • 14:30 Uhr

Seminarraum SE41 • Humboldt-Bau (Emil-Fischer-Straße 41, 97074 Würzburg)

Der Vortrag wird auch Zoom-Meeting übertragen: go.uniwue.de/ifmcolloquium-zoom

Abstract. The talk will illustrate two variational models related to liquid crystals.
Liquid crystals (LCs) are classical examples of mesophases that combine the fluidity of liquids with the orientational and positional order of solids. Nematic liquid crystals (NLCs) are the simplest type of LCs for which the constituent asymmetric molecules have no translational order but exhibit a degree of long-range orientational order, i.e. certain distinguished directions of averaged molecular alignment in space and time, referred to as ”directors”. Typically, there is experimental evidence of formation of defects, localized regions where the directors change their orientation. The first model is based on the continuum theory of Landaude Gennes where the modified elastic energy density is subquadratic near defects matched by a quadratic growth away from defects. We study minimizers of this modified LdG free energy, in the limit of a vanishing elastic constant. The limiting map is a regular map with a defect set that can support point and line defects. We also address the limiting behaviour in the low-temperature limit, for two-dimensional domains. This is a joint work with Apala Majumdar (University of Strathclyde) and Giacomo Canevari (Università di Verona).
The second model regards smectic liquid crystals. Here the molecules align locally parallel to one another in an averaged sense and tend to arrange themselves in layers. We attempt to describe surface defects in smectic A thin films by formulating a free discontinuity problem — that is, a variational problem in which the order parameter is allowed to have jump discontinuities on some (unknown) set. The free energy functional contains an interfacial energy which penalizes dislocations of the smectic layers at the jump. We discuss mathematical issues related to the existence of minimizers and provide examples of minimizers in some simplified settings. This is a joint work with John M. Ball (Heriot-Watt University, Edinburgh and Hong Kong Institute of Advanced Studies) and Giacomo Canevari (Università di Verona).

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https://www.mathematik.uni-wuerzburg.de/de/aktuelles/kolloquium

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