Likely instabilities in liquid crystal elastomers

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The study of material properties has traditionally used deterministic approaches, based on ensemble averages, to quantify constitutive parameters. In practice, these parameters can meaningfully take on different values corresponding to possible outcomes of the experiments. From the modelling point of view, stochastic representations accounting for data dispersion are needed to improve assessment and predictions. In this talk, I will present stochastic material models described by strain-energy densities where the parameters are characterised by probability distributions at a continuum level. To answer important questions, such as "what is the influence of probabilistic parameters on predicted mechanical responses?" and "what are the possible equilibrium states and how does their stability depend on the material constitutive law?", I will focus on likely instabilities in nematic liquid crystal elastomers. I will discuss the soft elasticity phenomenon where, upon stretching at constant temperature, the homogeneous state becomes unstable and alternating shear stripes develop at very low stress, and also some classical effects inherited from the underlying polymeric network, such as necking, cavitation, and shell inflation instabilities. These fundamental problems are important in their own right and may stimulate related mechanical testing of nematic materials.