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Disorder Measures and Non-equilibrium States of Cellular Matter SASCHA HILGENFELDT, SANGWOO KIM, YILIANG WANG, MechSE, University of Illinois at Urbana-Champaign — Cellular materials such as foams, emulsions, or biological tissues in general have a plethora of configurations in mechanical equilibrium. Identifying a global minimum (ground state) in a disordered domain system is a formidable task. However, protocols for lowering total energy through successive topological transitions have been suggested. Through modeling and simulations, we investigate systematic energy variation through a sequence of local equilibrium states, and the parallel changes in various measures of disorder and size-topology correlation in the structure. Statistical measures are identified that allow for quantification of the distance of the current structure from the ground state. This work can be applied as a tool to assess the mechanical state of foam or tissue structures from visual information only, with applications ranging from tissue diagnostics to regenerative medicine.

Sascha Hilgenfeldt
University of Illinois at Urbana-Champaign

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