Geometry of Mesoscopic Dynamics and Thermodynamics

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Abstract

Symplectic, Riemannian, and contact geometry provides a natural setting for mechanics, relaxation dynamics, and thermodynamics respectively. We show that the contact geometry provides also a natural setting for GENERIC dynamics (a combination of mechanic and relaxation dynamics arising in mesoscopic theories). Mesoscopic time evolution becomes in such setting a continuous sequence of Legendre transformations. Boltzmann kinetic theory and recently developed continuum mechanics of complex solids (involving elastic, internal (Cosserat), and plastic deformations) serve as an illustration.