Mechanics and Geometry of Structured Surfaces with a Continuous Distribution of Defects

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ABSTRACT

We explore the notions of material inhomogeneity and strain incompatibility in materially uniform structured surfaces. In general terms, a materially uniform body is said to be homogeneous if there exists a globally differentiable map from any configuration of the body to its undistorted state; this usually amounts to the body being free of topological defects. Whenever material inhomogeneity leads to incompatibility, it subsequently becomes a source of internal stresses in the body. A fundamental problem in micromechanics is, for a given distribution of defects in a solid, to determine the resulting state of deformation and stress field. In this talk, we will first discuss the geometrical nature of various topological defects over a structured surface, and then present a recently developed framework where the problem can be addressed for a broad class of thin structures including crystalline thin films, nematic shells, and biological membranes. We will also present some boundary value problems, to be solved for internal stresses and natural shape, under various simplifying assumptions such as that proposed by Kirchhoff and Love.

For background literature and further references please look at the bibliography in [1, 2].

References

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[1] This is a joint work with my PhD student, Mr. Ayan Roychowdhury.