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# A model for fibrous elastic surfaces incorporating geodesic fiber bending energy


## *Abstract*

Printed lattice structures, when suitably loaded, are known to exhibit co-existent phases characterized by piecewise uniform lattice shear. To model this effect and other aspects of lattice mechanics, in this work we formulate a continuum model of a thin plate formed by a continuous distribution of intersecting fibers that, unlike conventional plate theories, accommodates an elastic response to geodesic (in-plane) bending of the fibers, in addition to further non-standard effects associated with mutual fiber interactions. The model furnishes a practical application of two-dimensional strain-gradient elasticity. Numerical simulations faithfully reproduce the phase coexistence observed in a simple printed lattice.



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## *Biography*

David Steigmann is a Professor of Mechanical Engineering at the University of California, Berkeley. He received his B.Sc., and M.Sc. degrees in aerospace engineering from University of Michigan and MIT and Ph.D. in applied math from Brown University. His research interests are mechanics of thin films and thin-film/substrate systems, electromagnetic phenomena in solid mechanics; applications to thin-film/substrate problems, surface stress, capillary phenomena, biological cell membranes and surfactant films. His recent awards include the Levi-Civita Prize in 2013 and the Engineering Science Medal in 2013. He is the Editor in Chief of Mathematics and Mechanics of Solids and the Solid Mechanics Editor of ZAMP and serves on the editorial board of eight other international journals.


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