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Curvature induced effects on undulatory waves in lower dimensional elastic structures. JONATHAN KERNES, ALEX J. LEVINE, UCLA — Nature abounds with a variety of lower dimensional elastic structures, such as stiff cytoskeletal filaments, cell membranes, graphene sheets, and carbon nanotubes. Understanding their thermal fluctuations demands that one account for the effect that curvature of the undeformed (i.e. elastic reference) state has on the mechanics of deformation. This results from the fact that curvature couples in-plane stretching to bending even at linear order in deformation. We investigate the effects of this coupling by studying the scattering of undulatory waves on elastic rods and membranes from local changes in curvature. We show that curved regions lead to strong backscattering of undulatory waves, suggesting localization induced by geometry. We also explore the "tunneling" of undulatory waves through high curvature regions, via their conversion into stretching modes. Finally, we consider the undulatory wave band structure of periodically curved or corrugated elastic materials.

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