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**Confined semiflexible biopolymers suppress fluctuations of soft membrane tubes** STEVEN ABEL, SINA MIRZAEIFARD, University of Tennessee, Knoxville — Membrane nanotubes are tubular membrane structures that contain actin and connect cells over long distances. Disrupting the actin cytoskeleton abrogates membrane nanotubes, making them an interesting model system for studying membrane-biopolymer interactions. In this study, we use Monte Carlo computer simulations to investigate tubular, elastic membrane structures with and without semiflexible polymers confined inside. At small values of membrane bending rigidity, fluid membranes adopt irregular, highly fluctuating shapes while non-fluid membranes maintain extended tube-like structures. With increasing bending rigidity, fluid membranes exhibit a local maximum in specific heat that is coincident with a transition to extended tube-like structures. We further find that confining a semiflexible polymer within a fluid membrane tube suppresses membrane shape fluctuations and reduces the specific heat of the membrane. Polymers with a sufficiently large persistence length can significantly deform the membrane tube, leading to localized bulges in the membrane that accommodate regions in which the polymer forms loops. Analytical calculations of the energies of idealized polymer-membrane configurations provide additional insight into the formation of polymer-induced membrane deformations.

Steven Abel
University of Tennessee, Knoxville

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