

ACMS Grad & Postdoc Seminar

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Wednesday, March 4, 2026
154 Hurley Hall
3:30 PM – 4:30 PM

Nematic Materials on Curved Surfaces with Immersed Inclusions

In eukaryotic cell nuclei, the nuclear envelope is a double-membrane composite reinforced by lamins (fibers) and populated with nuclear pore complexes (NPCs) that gate nucleo-cytoplasmic transport. Controlling surface nematic textures provides a way to tune nuclear rigidity and structural integrity and to organize NPC number, spacing, and mobility on inclusion-rich membranes. We study Landau-de Gennes Q-tensor nematics on a sphere perforated by N circular inclusions that enforce tangential anchoring, computed with SurfaceFun on a high-order cubed-sphere. Each inclusion contributes one unit of boundary winding, which fixes the interior charge at $2-N$. Taken together, these findings suggest that tuning the number of inclusions N , and thereby the defect budget ($2-N$), may provide a practical route to shape morphology and, in turn, bolster the structural integrity of closed shells.

The Department of Applied and Computational
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