



SOCIETY of PHYSICS STUDENTS



“Topological Defects in Materials Science, Art, and Design”

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Abstract: Topological defects play a starring role in materials science. We'll review examples of topological defects in crystalline solids, passive and active liquid crystals, lipid membranes, and shape-morphing liquid crystal elastomers, comparing/contrasting the mechanisms governing pattern formation in each of these systems. We will in particular highlight our recent work on the Frank-Read mechanism for disclination loop generation in nematic liquid crystals [1], and a novel agent-based model of confined active matter [2]. On a lighter note, we'll consider topological defects in the context of art and design, and identify their analogs in the science of hard and soft materials.

[1] C. Long, M. J. Deutsch, J. Angelo, C. Culbreath, H. Yokoyama, J. V. Selinger, and R. L. B. Selinger, "Frank-Read Mechanism in Nematic Liquid Crystals," *Physical Review X* 14, 011044 (2024).

[2] B. Klein et al, "Spontaneous Optimal Mixing via Defect-Vortex Coupling in Confined Active Nematics," <https://arxiv.org/abs/2503.10880v2>

Tuesday, October 14th, 2025
SR 151, 11:30 am

Pizza provided by SPS