

# DEPARTMENT OF PHYSICS & ASTRONOMY

## Fall 2026 Colloquium

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**Maxim Lavrentovich**

Worcester State University

(Host: Dr. Dima Bolmatov)

**3:30 - 4:30 p.m. | Tuesday, October 13**  
**Science Building 234**

**Spontaneous structures driven by electrostatics and  
elasticity in ferroelectric nematic liquid crystals**

Liquid crystals provide an accessible setting in which local interactions can produce complex structures on much larger length scales. Ferroelectric nematic liquid crystals add a new ingredient: in addition to orientational order, they possess a macroscopic electric polarization. This polarization fundamentally changes the physics. A spatially uniform polarized state can generate costly depolarization fields, while avoiding these fields requires distortions of the liquid-crystal orientation and therefore costs elastic energy. I will discuss how competition between long-range electrostatics and nematic elasticity produces a remarkable variety of structures. Films of the material spontaneously develop left- and right-handed twists of the polarization, producing chiral domains despite the absence of molecular chirality. The same competition gives rise to solitonic domain walls, stripes of alternating polarization, and radial sector-like domains. In droplets, confinement and topology lead to hyperbolic hedgehog defects that reorganize the polarization field and reduce costly splay deformations. Together, these structures show how geometry, boundary conditions, topology, and electrostatics select patterns in these unusual soft materials.

**Refreshments at 3 p.m. | SC 103**



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