

# PHYSICAL MATHEMATICS SEMINAR

## DEFECT DYNAMICS IN 2D ACTIVE NEMATICS AND POLAR FLUIDS

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### ABSTRACT:

Topological defects play a key role in two-dimensional active nematics, and a transient role in two-dimensional active polar fluids. In this talk, we describe the dynamics of defects in 2D active nematics and polar models, both in the limit of strong order and overdamped, compressible flow. We consider an approximation for the global texture motivated from the passive case where the defects are widely separated and quasi-static, and use the variational principle to find defect dynamics within this ansatz. Common to both models, we find a position dependent “collective mobility” matrix, non-reciprocal and non-central active induced pair wise forces, and the emergence of +1 defects (composite in active nematics model and elementary in the active polar fluids model) in the steady state. In contrast to the active nematics model, in the active polar fluids model orientation dynamics cannot be ignored, and that in the steady state, active polar fluids are either devoid of defects or consist of a single aster. Moreover, in the active nematics model, we find that a linear chain of equally spaced bound states of pairs of +1/2 defects screens the activity term.

**TUESDAY, October 13, 2020  
2:30 PM – 3:30 PM**

<http://math.mit.edu/seminars/pms/>

<https://mit.zoom.us/j/97273690529>  
Meeting ID: 972 7369 0529