Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

**Investigating the effect of hydrodynamic and topological constraints on a confined active nematic material**[1] MICHAEL NORTON, ARVIND BASKARAN, ACHINI OPATHALAGE, APARNA BASKARAN, MICHAEL HAGAN, SETH FRADEN, Brandeis University — Understanding the role of boundary conditions on non-equilibrium materials is key to creating systems with designed behaviors. In this work we numerically investigate the behavior of a 2D active nematic confined to a circular container. The evolution of the nematic order tensor is governed by Landau-deGennes free energy descent with convection and flow-alignment; hydrodynamics are driven by the active, extensile stress and balanced by viscous dissipation. Boundaries plays a dual role, enforcing both no-slip & impermeable conditions, and setting the total topological charge of the system (for parallel anchoring the net charge is +1). We examine the dynamics of +/- 1/2 defects, which spontaneously form, as a function of nematogen density and activity. We identify an activity/density threshold below which the system coarsens into two co-rotating +1/2 defects; above this threshold, defects proliferate similar to a bulk nematic. We observe interplay between hydrodynamics and topology by introducing patches of perpendicular (rather than parallel) anchoring. While a net charge of +1 is maintained under strong activity, below a threshold activity the system transitions to a charge of +3/2.

[1]NSF DMR 1420382, NSF DMREF 1534890

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Date submitted: 11 Nov 2016 Electronic form version 1.4