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Multicellular Systems Organize as Active Nematic Liquid Crystals

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An important feature of materials made of active particles is the emergence of coherent collective motion, examples ranging from fish schools down to biopolimer solutions. In mammalian cells the collective dynamics give rise to tissue self-shaping during development, regeneration, cancer invasion and etc.

Accumulating experimental evidence shows that various cell types are organized as nematic liquid crystals. Cells in bidimensional cultures tend to align together and form well-oriented domains of finite size separated by nematic defects of charge ± 1/2. However, unlike passive liquid crystals cells move creating complex dynamic patterns.

I will show spontaneously emerging turbulence in epithelial cell cultures that occurs at low Reynolds numbers [1]. By analyzing a large population of vortices, we establish that topological defects serve as a template for turbulent flows. In another example, I will show left-right symmetry breaking and emergence of spontaneous shear flows of spindle-shaped cells plated in stripes, which is interpreted as a Fréedericksz transition controlled by the activity of the cells [2].

[1] **Physical Review Letters**, (2018), 120(20): 208101

[2] **Nature Physics**, (2018), 14(7): 728-732

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Zoom Meeting
https://us02web.zoom.us/j/85826448625?pwd=UTMxd0tHekVqSFVUcFIrUmJ1VFhrQT09
Meeting ID: 858 2644 8625
Password: 8FgKD8

Date & Location:

Tuesday, June 3, 2020, 11:00
Lecture room, ZOOM MEETING