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Forum de Physique Statistique @ ENS

Mercredi 13 Mai 2020, 14 :30
LPENS, https ://zoom.us/j/851050904
Domaines : cond-mat.stat-mech

Titre : *Active Fluids : Topological Defects, Turbulence, and Phase Separation*

Orateur : **Ricard Alert Zenón (Princeton University)**

Résumé : *Active fluids display striking collective phenomena not possible in passive fluids. Examples include spontaneous flows powered by microscopic constituents, and phase separation in the absence of attractive interactions. In this talk, I will discuss three aspects of the physics of active fluids, connected with experiments in both biological and artificial soft matter systems. First, I will show that dense colonies of the rod-shaped motile bacterium Myxococcus xanthus form active liquid crystals. I will show that topological defects of the cell alignment field induce flows that lead to the formation of new cell layers, which triggers the development of multicellular structures called fruiting bodies. Second, I will discuss chaotic flows in active liquid crystals. I will show that, as in classic turbulence, the statistical properties of these active flows at low Reynolds number are described by universal scaling laws. Unlike classic turbulence, however, this type of active turbulence requires no energy transfer across scales. Finally, I will present a new mechanism of liquid-gas phase separation in active fluids. I will show that, in addition to repulsive forces that oppose phase separation, artificial self-propelled Janus colloids experience torques that reorient particle motion toward high-density regions, providing a novel route to phase separation.*