

## ICTS Seminar

Title : Electrohydrodynamics of epithelial tissues

Speaker : Niladri Sarkar, Lorentz Institute for Theoretical Physics,  
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Date : Tuesday, January 7, 2020

Time : 2:00 PM

Venue : Emmy Noether Seminar Room

Abstract : We study the dynamics of a thick polar epithelium subjected to the action of both an electric and a flow field in both planar and spherical geometry. We develop a generalized continuum hydrodynamic description and describe the tissue as a two component fluid system. The cells and the interstitial fluid are the two components and we keep all terms allowed by symmetry. In particular we keep track of the cell pumping activity for both solvent flow and electric current. We study the growth dynamics of a tissue slab, its steady states and obtain the dependence of the cell velocity, net cell division rate, and cell stress on the flow strength and the applied electric field. We find that finite thickness tissue slabs exist only in a restricted region of phase space and that relatively modest electric fields or imposed external flows can induce either proliferation or death. We also find that fluid pumping and active flexoelectricity is a contributor to lumen formation in spherical epithelium, and gives rise to interesting dynamics by the tissue after lumen nucleation.