

ICTS Seminar

Title : Patterned flows: from active films to turbulence

Speaker : Jason Picardo, ICTS-TIFR, Bangalore

Date : Monday, March 11, 2019

Time : 2:15 PM

Venue : Amal Raychaudhuri Meeting Room, ICTS Campus, Bangalore

Abstract : Many fluid dynamic problems in nature and industry give rise to self-organized patterns, which apart from their beauty also govern transport rates and forces in these systems. In the course of this talk, we will encounter two very different kinds of patterns: (a) laminar oscillatory flows in the cortices of biological cells, and (b) coherent vortical structures that characterize the small-scales of turbulent flows. In the first part of the talk, I shall show how concentration gradients of a motor protein (myosin) in the cell cortex can drive active stresses and flows, which couple back to the concentration field to produce spontaneous oscillatory states. In contrast to other mechanisms for generating oscillations in biological systems, this mechanism requires only one active species. The second half of the talk will focus on the transport of elastic filaments by a turbulent flow. Here, we shall see that contrary to our expectation of enhanced mixing, turbulent flow structures actually cause the filaments to de-mix and accumulate within the flow. I will also show how flow structures impact collisions between heavy particles, which has implications for the initiation of warm rain in clouds.