

ICTS PhD Synopsis Seminar

Title : Driven Stokesian suspensions: particle anisotropy, effective inertia and transient growth

Speaker : Rahul Chajwa, ICTS-TIFR, Bangalore

Date : Thursday, July 23, 2020

Time : 04:00 PM

Venue : Online seminar (Please use this link to join the seminar - <https://zoom.us/j/93709546823?pwd=YIFFeW93NEVWUHJLQ1FPeVhHcFhQdz09>
Meeting ID: 937 0954 6823
Password: 173371)

Abstract : Driven Stokesian suspensions offer a classical and notoriously difficult problem in many-body physics, and particle-shape anisotropy makes it even richer. I will present experimental and theoretical investigations of how an effective inertial dynamic emerges in this purely dissipative system. We find: 1) A pair of disks settling under gravity re-create the bound and scattering states of Keplerian celestial dynamics, thanks to the $1/r$ of the viscous hydrodynamic kernel. 2) A sedimenting one-dimensional lattice of orientable objects can display wavelike excitations of displacements and orientations, evading the clumping instability inevitable for spheres. 3) This lattice dynamics exhibits transient algebraic growth of an effective perturbation "energy", paving the way for nonlinear instability even in the linearly stable regime and explicitly demonstrating the unreliability of linear stability analysis for driven dissipative systems. 4) Inertialess self-propelled particles in a vertical flow give rise to centrifugation and caustics, reminiscent of inertial particles.