



ICTS Fluid Seminar (HYBRID)

Title : Frictionless flow with magnetic confinement: when fluids and magnetism join hands

Speaker : Arvind Arun Dev (Cornell University)

Date : Friday, 20th October, 2023

Time : 11:00 AM (IST)

Abstract : Magnetism and fluid mechanics are two key areas of physics, with their ubiquitous interactions, from kitchen to power plants, magnetic resonance imaging (MRI) machines in hospital to the generation of magnetic field by the motion of molten liquids in earth's core. This talk will discuss the interaction of magnetism and fluid mechanics in the context of our work; flow mechanics in microfluidic channels. Microfluidics plays a very important role in providing solutions, ranging from medical diagnostics to mimicking biological organs. The flow mechanics in micro channel is very well explained by the Navier-Stokes equation under low Reynolds number limit. However, despite decades of research, a major challenge remained is to tailor the large viscous drag experienced with decreasing size of the flow channel. We will discuss a novel experimental method in which the flowing liquid channel is encapsulated by a lubricating liquid made up of ferrofluid held in place by magnetic forces. A large drag reduction reaching 99% is achieved with direct evidence of record large slip length (mmscale, 99% plug flow) at the liquid-liquid interface, governed by a modified Reynolds number. We will also talk through the softness of liquid-liquid interface and conditional stability provided by the magnetic forces against the famous Plateau-Rayleigh instability (PRI). The unique properties of the liquid tube like tunable viscous drag, flow-induced reversible deformations make it suitable for drug delivery, viscous/dense suspensions flow, biomaterial transport, bioprinting and mimicking arteries, veins among other complex interfaces, overcoming the current limitations of microfluidics and opening new possibilities.

Venue : **Offline:** Feynman Lecture Hall

Online: Please click on the below link to join the seminar

<https://icts-res-in.zoom.us/j/88361986751?pwd=9bw0Di3S6EUgi7WDhR10yFDV9bvZhp.1>