



ICTS Biophysics Seminar

Title : Structural Complementarity Maximizes Feasibility and Stability in Microbial Community Coalescence

Speaker : Samraat Pawar (Imperial College London, United Kingdom)

Date : Friday, 27 March 2026

Time : 2:00 PM (IST)

Abstract : Microbial communities frequently coalesce through dispersal, disturbance, or deliberate transplantation, yet the dynamical consequences of such coalescence remain poorly understood. In this talk I will show new theoretical results that show how coalescence can be used to enhance microbial community robustness. Using a mechanistic consumer–resource model in which the balance between competition and metabolic cooperation is explicitly tunable, we quantify how interaction structure shapes both feasibility, namely the environmental domain supporting coexistence, and dynamical stability. Cooperation-dominated communities exhibit greater but broader feasibility and intrinsic stability than competition-dominated communities. Strikingly, coalescing communities with maximally distinct interaction structures consistently maximises both feasibility and stability of the resulting assemblage. Heterogeneous coalescence balances reduced facilitation, moderated interspecific effects, and stronger self-regulation. These results identify structural complementarity as a general principle for assembling robust microbial ecosystems and provide a theoretical foundation for microbiome engineering strategies that enhance persistence and functional stability.

Venue : AKR Meeting Room

Zoom link: <https://icts-res-in.zoom.us/j/92570579662?pwd=d3kEPRSulw9AO2mFhPgs6EvivT4paP.1>

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