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ICTS Statistical Physics and Condensed Matter Seminar

Title : Inhomogeneous phases and glasses- a many body perspective

Speaker : Zohar Nussinov (Washington University in Saint Louis, United States)

Date : Friday, 08 August 2025

Time : 3:30 PM (IST)

Abstract : Competing interactions/effects may give rise to states exhibiting inhomogeneous structure and/or correlations with possible slow dynamics. We will explain how these arise in various simple theories and detail the emergence of "avoided critical points." Next, we will illustrate that even conventional systems (having otherwise homogeneous liquid and crystalline states) may display similar behaviors. Towards this end, we introduce general results for long-lived non-equilibrium states and then apply these results to the analysis of supercooled liquids that form glasses. These considerations will lead to predictions for general properties of supercooled liquids. The predictions include distributions of relaxations and velocities, a collapse of the viscosity and dielectric response of supercooled fluids with a single dimensionless parameter along with associated heat capacity peak width and structural correlations. This collapse is tested and found to indeed occur over 16 decades of relaxation times for all experimentally known types of glass formers (with a nearly constant value of the dimensionless parameter across all liquids). Relatedly, numerically, we find non-trivial deviations from conventional equilibrium dynamics when various thermostats emulating the supercooling process are used. We will illustrate how driving classical and quantum systems can lead to non-equilibrium states with long-range correlations and conclude with speculations about potential connections to various phenomena (including Mpemba-like effects).

Venue : Emmy Noether Seminar Room

Zoom Link: <https://icts-res-in.zoom.us/j/98824882813?pwd=bUQQg6xuWdTkEZTF86SWOnY8B5xVwn.1>

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