WINTER SEMESTER 2025 / 2026

RTG 2756 CYTAC SEMINAR SERIES

TUESDAY, JANUARY 20
17:00 IN HS5

CYTAC

RTG 2756

PROF. DR. ABHINAV SHARMA

Theoretical Physics of Biological Systems, Augsburg University

MECHANICAL PHASE TRANSITION IN BIOPOLYMER NETWORKS

Biopolymer networks such as collagen are typically well below the isostatic threshold and therefore intrinsically floppy. Yet, when subjected to deformation, even these sub-isostatic networks can undergo a sharp transformation into a rigid state. I will show how this strain-controlled transition constitutes a continuous mechanical phase transition, with clear critical signatures captured by simulations of fibrous networks and experiments on type-I collagen. Using a real-space renormalization approach, we uncover scaling relations between the critical exponents and establish the universality of this transition across different network architectures. I then link this static criticality to dynamics: near the onset of rigidity, nonaffine rearrangements dominate, giving rise to diverging relaxation times, power-law rheology, and a simple quantitative connection between nonaffinity and viscosity.