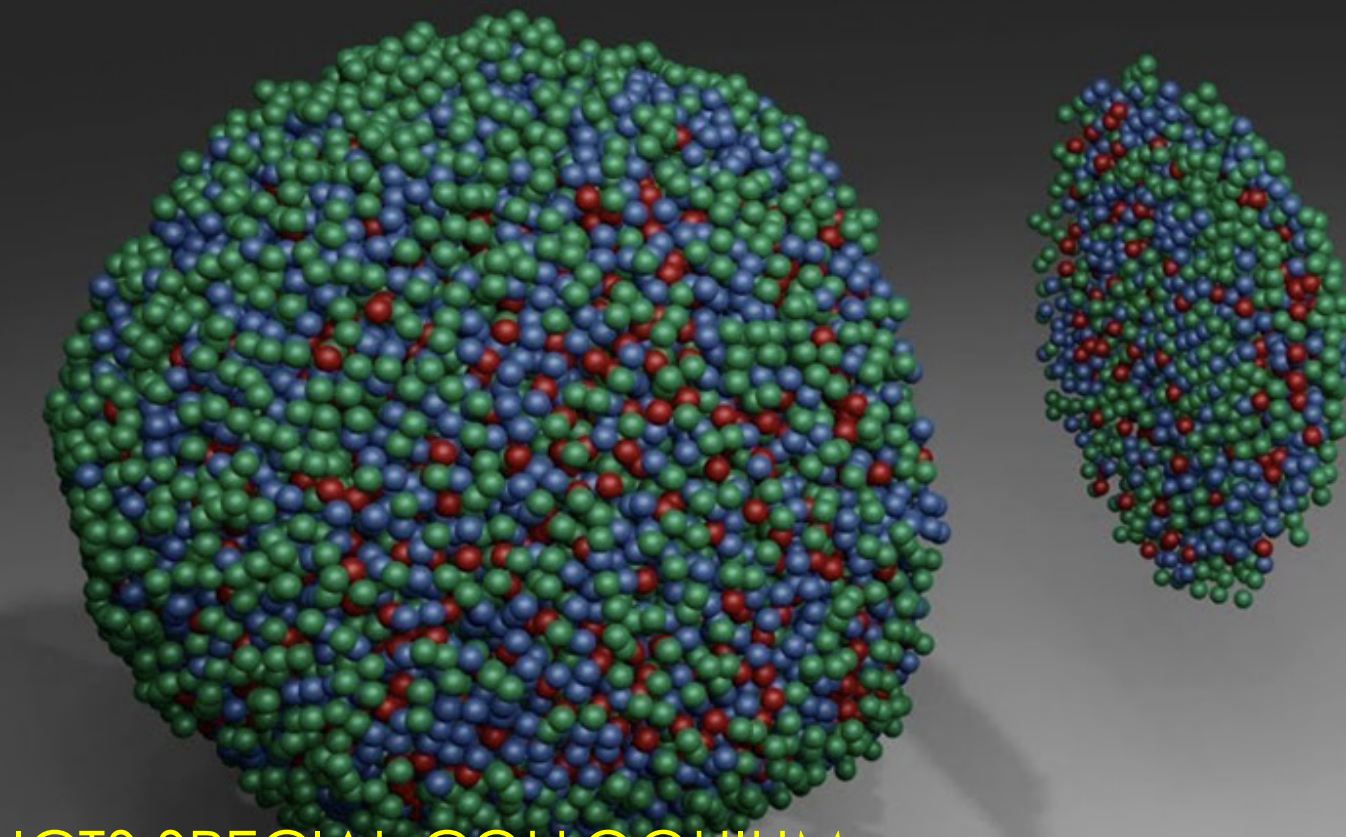




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ICTS SPECIAL COLLOQUIUM

Dipole induced topological transition in three-dimensional amorphous solids

The Kosterlitz-Thouless and the Hexatic phase transitions are celebrated examples of dipole (vortex, dislocation) induced transitions in condensed matter physics. For very clear reasons, these important "topological" transitions are restricted to 2-dimensions. In this lecture I will present a genuine dipole-induced transition in the 3-dimensional response of (athermal) amorphous solids to applied strain. Similarly to the existence of a hexatic phase between normal solid and fluid, we identify an intermediate phase between a phase of normal elastic response at high pressure, and fluid matter at zero pressure. The mechanical response in the intermediate phase is accompanied by plasticity that is generically associated with "non-affine" quadrupolar events seen in the resulting displacement field. Gradients of the quadrupolar fields act as dipole charges that screen elasticity, breaking both translational and Chiral symmetries. We highlight angular correlations that exhibit diverging correlation lengths at this transition and determine the critical scaling exponents.



Itamar Procaccia

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Bio: Prof. Procaccia is a leading theoretical physicist and chemist whose work has significantly shaped the understanding of complex natural phenomena characterised by disorder, chaos, and nonlinear behaviour. Born in Tel Aviv, he earned his BSc and PhD from the Hebrew University of Jerusalem and conducted postdoctoral research at MIT before joining the Weizmann Institute in 1979. He has held several senior academic roles, including twice serving as dean of the Faculty of Chemistry and founding the Braginsky Center for the Interface between Science and Humanities. His research spans nonequilibrium thermodynamics, statistical mechanics, instabilities, chaotic dynamics, turbulence, and the physics of friction and fracture. Prof. Procaccia has received numerous prestigious honours, among them the Israel Prize in Physics, the European Physical Society Prize for Statistical and Nonlinear Physics, fellowships from leading scientific societies, and recognitions from academies across Europe and Asia. He currently holds the Barbara and Morris L. Levinson Professorial Chair in Chemical Physics.

Mon, 08 December 2025

15:30 - 17:00

Emmy Noether Seminar Room



Zoom link: <https://shorturl.at/Qtvfo>

Meeting ID: 986 7613 8664

Passcode: 080809