Laboratoire de Physique Théorique et Hautes Energies

Unité Mixte de Recherche (UMR 7589) de Sorbonne Université et du CNRS

SEMINAIRE du LPTHE

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Brandeis

Fragile Matter : Stress Networks and Stability of Athermal Solids

In this talk, I will discuss a theoretical framework for understanding materials that are fragile. These are marginal solids or highly viscous liquids that emerge out of thermal equilibrium in response to external stresses. Granular materials and non-Brownian colloidal suspensions are well-known examples, however, reconfigurable pathways of force transmission also play an important role in biological systems. In granular materials, external forces such as gravity create rigid and flowing states. The mechanical integrity of these marginal solids is reliant on a filamentary network of stress-bearing structures. An outstanding question in the field has been how the constraints of vectorial force balance influence the response of granular assemblies to stress, and create localized stress pathways. I will present results of recent work showing that the localized response is a consequence of the disorder in the underlying contact network, and can be mapped on to a "localization" problem. I will also discuss an interpretive theory, based on statistical ensembles, of two transitions driven by frictional contacts : shear jamming and discontinuous shear thickening.

Bibliothèque du LPTHE, tour 13/14, 4ème étage

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