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Colloquium of the Physics Department of ENS

Mercredi 23 Novembre 2022, 13 :30
DPT-PHYS-ENS, ConfIV (E244) - 24 rue Lhomond 75005 PARIS
Domaines : physics

Titre : *On the nature of the glass transition*

Orateur : **Matthieu Wyart (EPFL)**

Résumé : *Under cooling, a supercooled liquid undergoes a glass transition and stops flowing. Physicists do not agree on the microscopic reasons that make a glass solid. Some view this phenomenon as being collective in nature : it may be a signature of a thermodynamic phase transition, or being caused by kinetic constraints (where particles seek to solve a sort of Chinese puzzle). Others view it as simply reflecting elementary barriers for rearrangements, controlled by the elasticity of the material. Here I will focus on polydisperse numerical glasses, which are receiving a considerable attention, because they can be equilibrated as efficiently as experimental molecular liquids. I will (i) design new algorithms that can continuously speed up or slow down the normal physical dynamics, ruling out the role of a thermodynamic phase transition [1]. (ii) Introduce a novel algorithm to systematically extract elementary rearrangements in a broad energy range. It allows to make, for the first time, a quantitative prediction on the relaxation time, assuming that relaxation is not collective in nature. The comparison with observation is excellent [2]. (iii) I will explain why, in such a scenario, dynamical correlations emerge even if they have little effects on the dynamics [3]. (iv) I will discuss the nature of elementary rearrangements under cooling, and how these aspects relate to mean field description of glasses.*

[1] ongoing work with Cristina Gavazzoni and Carolina Brito [2] ongoing work with Wencheng Ji and Massimo Pica Ciamarra [3] ongoing work with Giulio Biroli, Misaki Ozawa, Marko Popovic and Ali Tahaei [4] joint work with Wencheng Ji, Tom WJ de Geus and Elisabeth Agoritsas

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