



ESPCI
Laboratoire PMMH
10 rue Vauquelin, 75231 Paris Cedex 05



Séminaire PMMH

Amphithéâtre Urbain (A1), Escalier N, RdC

Vendredi 1er avril 2016, 11h00-12h00

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Structural relaxation is a scale-free process

Structural relaxation is the process via which a liquid explores its equilibrium ensemble. It is responsible for the dramatic slowing down at the glass transition, and has thus received a quite considerable amount of attention. Yet, the mechanisms governing relaxation are still largely unknown.

We will explore liquid relaxation from the viewpoint that it results from a series of transitions which are akin to solid-solid transformations. This idea arises because, at low temperatures, liquids spend most of the time vibrating around local minima (inherent states, or ISs) of their potential energy surface. Since inherent states are, by definition, mechanically stable, they are genuine elastic solids. Hence, relaxation results from a series of transitions between elastic solids, and it follows that relaxation events should leave elastic imprints in the surrounding medium. To support this view, we carry out a systematic analysis of the statics and dynamics of the inherent stress field obtained from 2D and 3D numerical simulations.

Our first surprise is that the inherent stress field itself presents anisotropic and long-ranged (power-law) correlations, which are a clear indication of elasticity. Moreover, we directly observe that relaxation events create long-ranged and anisotropic stresses in the surrounding medium, just like solid-solid transformations. Finally, we can demonstrate that the relaxation events occurring over finite time windows are power-law correlated in space. It follows that the relaxation process is non-local, an observation which comes against the currently widely held belief that relaxation would decorrelate beyond some finite length scale. Our work brings evidence that elasticity plays a crucial role in liquid relaxation.

Prochain séminaire : vendredi 8 avril, Joseph Paulsen (Syracuse University)

Programme des séminaires : www.pmmh.espci.fr, onglet *Séminaires PMMH*

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