Abstract

More than 10 years ago, it was realized that mean field glassy dynamics, with the emergence of aging and effective temperatures, can be understood as quasi-equilibrium exploration of configuration space. The formalization of this notion, only recently proposed, defines a Markov chain where short times are coarse grained, and subsequent configurations are chosen according to a constrained Boltzmann distribution.

In mean field spin glasses, this pseudodynamic rule admits, in the long time limit, a description leading to glassy solutions identical to the ones corresponding to real (Langevin) dynamics. The treatment of the pseudodynamics through replicas unveils a longly suspected relation between replicas and the supersymmetry of the Langevin equation.

The application of the formalism to liquids avoids the difficulties related to short time conservation laws, and allows to use equilibrium approximation schemes of liquid theory to study long time dynamics. The scheme is applied to a closure scheme of hierarchical equations recently proposed by Szamel and to liquids in the hypernetted chain (HNC) approximation. It is shown that the former case leads to the standard Mode Coupling Theory (MCT) equations of Gœtze, thus giving an interpretation of it. The second case also gives rise to MCT-like equations, but in a framework where, differently from MCT that requires the input of equilibrium structure factors, static equilibrium and dynamical quantities are computed in a unified consistent framework.

Refs. SF and G. Parisi, JSTAT P02003 (2013), SF, G. Parisi and P. Urbani, arXiv:1212.4291