**Out of equilibrium dynamics of classical isolated systems**

Leticia F. Cugliandolo (LPTHE)

A topical issue (specially motivated by cold atom experiments and recent analytical developments) is whether an isolated many-body system is able to reach thermal equilibrium, acting as a bath on itself. The answer to this question is expected to depend on the kind of interactions between the constituents of the many-body system with an important distinction between so-called integrable and non-integrable systems: for the latter thermal equilibrium is expected while for the former it is not.

In cases with no standard (Gibbs-Boltzmann) equilibration one can ask whether a steady state is attained asymptotically and which could be the stationary measure that characterises it. The so-called Generalized Gibbs Ensemble plays a predominant role in this context, as an extension of the Gibbs-Boltzmann measure with as many effective temperatures as conserved quantities.

The subject of this research project is to explore the dynamics of a simple though non-trivial integrable many-body system, the Toda lattice [1], with numerical and analytic techniques. The main aim will be to check whether a recently proposed (quantum) method that allows to identify the effective temperatures of the Generalised Gibbs Ensemble [2,3] applies in the classical realm as well.

[1] M. Toda, "*Theory of non-linear lattices*" 2nd ed. (Springer-Verlag Berlin, 1988).

[2] L. Foini, A. Gambassi, R. Konik, L. F. Cugliandolo, "*Measuring effective temperatures in a generalized Gibbs ensemble*", L. Foini, A. Gambassi, R. Konik, L. F. Cugliandolo, Phys. Rev. E **95**, 052116 (2017).

[3] J. de Nardis, M. Panfil, A. Gambassi, L. F. Cugliandolo, R. Konik, L. Foini, "*Probing non-thermal density fluctuations in the one-dimensional Bose gas*", SciPost **3**, 023 (2017).