



SEMINARIO

Revealing conservation laws from out-of-equilibrium measurements

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The non-equilibrium dynamics of quantum many-body systems is one of the most challenging problems in physics, with ramifications from quantum matter to solid-state systems. An area of particular interest is the relaxation to equilibrium of quantum systems. The emergent field of quantum thermodynamics tackles this issue applying the principles of statistical mechanics to provide general results to open questions such as how do quantum systems equilibrate, or how to extract useful work from them.

Among these results, quantum fluctuation relations (QFRs) are especially powerful, in that they enable new measurement protocols based on purely out-of-equilibrium measurements. In this talk, I will review these advances, and present a new set of generalised QFRs suitable for systems with a number of conservation laws constraining its dynamics [1]. Time permitting, I will discuss our ongoing work to extend this method to characterise the many-body-localised phase in atomic quantum simulators [2].

[1] J. Mur-Petit, A. Relaño, R. A. Molina & D. Jaksch, *Nature Comms.* 9, 2006 (2018).

[2] M. Schreiber et al., *Science* 349, 842 (2015); J. Smith et al., *Nat. Phys.* 3783 (2016).