Relaxation, thermalization, and a quantum algorithm to prepare Gibbs states

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This talk will be concerned with recent progress on understanding how quantum many-body systems out of equilibrium eventually come to rest. The first part of the talk will highlight theoretical progress on this question - employing ideas of Lieb-Robinson bounds, quantum central limit theorems and of concentration of measure [1-4]. These findings will be complemented by experimental work with ultra-cold atoms in optical lattices, constituting a dynamical 'quantum simulator', allowing to probe physical questions that are presently out of reach even for state-of-the-art numerical techniques based on matrix-product states [5]. The last part of the talk will sketch how based on the above ideas, a fully certifiable quantum algorithm preparing Gibbs states can be constructed, complementing quantum Metropolis algorithms [6].

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