Entropy cooling of correlated electron systems

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A nontrivial achievement in the field of nonequilibrium quantum matter is the induction of long-range order. A promising strategy is the light-induced evaporative cooling of electrons or holes in correlated materials [1]. This cooling scheme exploits the potentially large entropy change associated with a charge transfer between different bands. Using nonequilibrium dynamical mean field theory and a multi-band set-up, we show that suitably designed chirped laser pulses allow to realize this cooling effect. In particular, we demonstrate the emergence of antiferromagnetic order in a system which is initially in a weakly correlated state above the maximum Neel temperature [1], and the emergence of eta pairing in a Mott insulating system [2]. I will also discuss an alternative cooling scheme based on changes in the spin entropy which can be induced in multi-orbital Hubbard models in the vicinity of a spin state transition. This mechanism may be used to induce excitonic order [3]. Our work suggests a general strategy for realizing cold effective eletronic temperatures and electronic orders light-driven or quenched systems.

References:

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