On the conversion of work into heat: microscopic models and macroscopic equations

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Abstract. We summarize and extend some of the results obtained recently for the microscopic and macroscopic behavior of a pinned harmonic chain, with random velocity flips at Poissonian times, acted on by a periodic force at one end and in contact with a heat bath at the other end. Here we consider the case where the system is in contact with two heat baths at different temperatures and a periodic force is applied at any position. This leads in the hydrodynamic limit to a heat equation for the temperature profile with a discontinuous slope at the position where the force acts. Higher dimensional systems, unpinned cases and anharmonic interactions are also considered.

Keywords. Harmonic chain, periodic force, heat equation for the macroscopic temperature, Dirichlet-Neumann type boundary conditions, work into heat.