Exactly solvable models of heat conduction

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Abstract: Transport of heat in low dimensional systems gives rise to extremely difficult mathematical questions (and possibly also new interesting physical phenomena, e.g. pure carbon material with very large heat conductivity). The stationary measure of a non-equilibrium systems in contact with two heat reservoir working at different temperatures is in general not know and characterized by long-ranged correlations. In this talk we describe a class of probabilistic models which can be used to study heat conduction in 1 dimension and which can be exactly solved. Energy correlation functions can be computed by the use of a suitable dual process which allows to reduce the number of degree of freedom in the problem. A constructive approach to the discover of a dual process will be described which makes use of hidden underlying symmetries. The dual process of the heat conduction model turns out to be the bosonic version of the "exclusion process" and has attractive interactions and positive correlations.

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