

EPSD 6634

Research Visit C. Van den Broeck to R. Harris (Queen Mary London)

29.04-02-05

I presented in some detail my approach to stochastic thermodynamics including a talk to a wider audience.

The following issues were discussed in more detail :

With Prof. R. Harris

The connection between the zero range process and the myopic process with Kangaroo processes. Large deviation properties of the former and the last can be calculated analytically. It should be possible to solve the myopic process for small number of states. This process seems also to be closely connected to my recent paper on transport and self-transport in compartmentalized one-dimensional systems. In this problem we did incorporate « appropriate thermodynamics constraints » for the transition rates. We will further explore the connection between these models in a future collaboration.

With Prof. R. Klages

We discussed at some length the value and range of application of stochastic thermodynamics for Markov processes, particularly in connection with the fact that there is genuine evidence that some physical processes are better described by non-Markovian or even long-tail type of processes. We personally believe this not to be a fundamental issue from the thermodynamic point of view, but rather an issue of choosing the right variables. Like for glasses a correct thermodynamic description even at the macro level is still a matter of debate

With Prof. I. Ford

Prof. Ford pointed out in one of his papers that the separation into adiabatic and non-adiabatic component is more difficult when the

variables are odd under time reversal. The point is that the probability for not changing a state may not be invariant under speed inversion. We discussed this issue. In my recent work on the Kangaroo process, it is found that this problem does not arise because the condition of detailed balance implies that the transition rates are even in the speeds. It needs to be further investigated whether there is a deeper thermodynamic constraint which solves the issue.

With Prof. A. Baule

We discussed the proper translation of the concepts and techniques from stochastic thermodynamics or discrete Markov processes to continuous ones. I am working on a more didactic exposition of these issues. Prof. Baule is also interested in applying stochastic thermodynamics to processes with multiplicative noise. This should be possible by starting with a description with additive noise and making the adiabatic elimination of a fast variable. This could be the subject of a future collaboration.