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## Duality, bosonic particle systems and some exactly solvable models of non-equilibrium

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# Stellingen

*Propositions belonging to the thesis*

## **Duality, Bosonic Particle Systems and Some Exactly Solvable Models of Non-Equilibrium**

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1. The inclusion process has a natural graphical representation based on Poisson processes. Running the same Poisson processes from different ordered initial conditions does however not preserve the order in general. In the course of time, additional discrepancies can be created.
2. Using the graphical representation of the standard symmetric exclusion process with  $N$  colors, we obtain a natural generalization of the symmetric exclusion process with  $SU(N)$  symmetry and self-duality properties. Surprisingly, this model has not been studied in the literature.
3. The symmetric inclusion process on two sites coincides with the Moran model with mutation rate  $m$ . Therefore, besides self-duality also duality with the ancestral process holds. This corresponds to two representations of the Heisenberg algebra: one with the discrete creation and annihilation operators from the thesis and another using an appropriate discrete derivative as annihilation operator.
4. The asymmetric inclusion process with drift to the left on the positive half-line when started from a Poisson initial distribution exhibits condensation at the origin.
5. There exists a general class of probability measures with positive correlations for the self-duality functions of the inclusion process that is closed under the evolution of the inclusion process. This class contains special product measures (local Gibbs measures), but also measures that are non-product.
6. The theory of McLennan ensembles does not apply to the Brownian Momentum Process coupled weakly to the heat bath. This is due the fact that the BMP's with different strengths of couplings are not absolutely continuous with respect to each other.
7. In the symmetric inclusion process on a finite lattice with periodic boundary conditions, all particles will condensate on a single site as  $m$  goes to zero. The pile itself will perform a continuous-time random walk on a time scale inversely proportional to  $m$ .
8. Nonexistent scientists can have a rather extended publication list (Leuven, KU: 39 papers) or have a few well-cited papers (Bestiale, S, J Stat Phys 48, 709-726).
9. The unintelligibility of the most unfathomable statements is not directly proportional to their relevance.
10. To be a mathematician or physicist or chemist or else depends on the point of view of the observer, and in turn depends on whether the observer is a mathematician or physicist or chemist or else. This might therefore be considered an entangled quantum mechanical problem.
11. Some facts; the defense ceremony is scheduled unintentionally at 16:15 on 13.12.11. Moreover  $16+15+13+12+11=67$ , which happen to be the 19<sup>th</sup> prime number. If one add the missing 14, then the sum will turn to 81, which is actually equal to  $3^4$ .