

Fall 2009 Condensed Matter Seminar series

Prof. Steffen Trimper

(Fachbereich Physik, Martin-Luther Universität Halle-Wittenberg)

*Exact solution of a stochastic
susceptible-infectious-recovered model*

Monday, Sept. 28

4:00 P.M.

304 Robeson

The susceptible-infectious-recovered (SIR) model describes the evolution of three species of individuals which are subject to an infection and recovery mechanism. A susceptible S can become infectious with an infection rate β by an infectious I type provided that both are in contact. The I type may recover with a rate γ and from then on stay immune. Due to the coupling between the different individuals, the model is nonlinear and out of equilibrium. We adopt a stochastic individual-based description where individuals are represented by nodes of a graph and contact is defined by the links of the graph. Mapping the underlying master equation onto a quantum formulation in terms of spin operators, the hierarchy of evolution equations can be solved exactly for arbitrary initial conditions on a linear chain.