ΓΕΝΙΚΟ ΣΕΜΙΝΑΡΙΟ ΤΜΗΜΑΤΟΣ ΦΥΣΙΚΗΣ

PHYSICS COLLOQUIUM

Thursday, 26 March 2009
17:00-18:00

3rd Floor Seminar Room

"Physics of Many-Body Systems via the Mathematical Backdoor"

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Abstract

The talk is centered around exact solutions of correlated quantum spin and itinerant fermion systems in 1+1 dimensions. In the introductory part I will discuss important classical results for seminal models like the Heisenberg quantum spin chain, the super-symmetric tJ-model, but also for some corresponding classical systems like the 2d Ising model. These models are realizations of integrable systems as they possess --in the thermodynamic limit-- infinitely many conserved currents. These models are usually solvable by some kind of Bethe ansatz. In contrast to these models there are non-integrable systems with exactly known ground-states of for instance matrix-product type.

The natural question arises about the conditions for obtaining non-trivialexplicit results for a many-body system and about the actual calculations. It appears that approaches via the ``frontdoor'' like the construction of the eigenstates by Bethe ansatz are more involved than approaches via the "backdoor" like setting up and solving for functional equations. Typical results comprise the free energy of quantum chains and their correlation functions. New results for the correlation functions of the spin-1/2 Heisenberg chain with possible use for the interpretation of ESR data are presented.