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"Quantum Nonequilibrium Dynamics"

Summer School on Quantum Many-Body Physics of
Ultra-Cold Atoms and Molecules

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ICTP, Trieste - Italy

Lecture 1: Integrable Partial Differential Equations: solitons, etc

- A brief introduction to the inverse scattering problem
- Lax phenomenon for the Koteweg-de Vries equation
- Brief exposure to the Lax phenomenon for the Nonlinear Schroedinger Equation (NLSE)
- Solitons in NLSE: memory of the initial soliton decomposition

Lecture 2: Bethe Ansatz

- Introduction to root systems
- A_2 kaleidoscope and three 1D delta-interacting bosons
- Non-crystallographic and exceptional root systems and exotic particle systems
- Bethe Ansatz per se
- Hard-core bosons, quantum solitons, etc: memory of the initial momenta

Lecture 3: Thermalization and the Hilbert-Schmidt geometry of quantum observables

- Thermal and state-to-state fluctuations
- Hilbert-Schmidt inner products and measures of thermalizability
- Eigenstate thermalization, Generalized Gibbs ensemble, and the question of which integrals of motion affects dynamics the most