"Non-equilibrium dynamics"

within the programme "Quantum Paths"

April 30 – May 4, 2018

organized by

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- **Monday, April 30, 2018**
  14:00 Andrey Zheludev (ETH)
  Quantum particles in a random potential in high dimensions

- **Wednesday, May 2, 2018**
  15:00 Thierry Giamarchi (Geneva)
  Double sine-Gordon transitions in quantum spin chains

- **Thursday, May 3, 2018**
  11:00 Masaki Oshikawa (ISSP)
  Polarization in quantum many-body systems

  I will discuss polarization in quantum many-body systems, mainly in one spatial dimension. Under the periodic boundary condition, the polarization is not completely well-defined because of the absence of the surface charge, even in insulators. Nevertheless, it can be formulated as a Berry phase with respect to a flux piercing the ring. I will discuss possible inequivalent definitions of the Berry phases and clarify the relation among them. On the other hand, the polarization is ill-defined in insulators. The "ill-definedness" however can be quantified as a scaling of polarization amplitude. We find a curious power-law scaling in various interacting many-body systems in one dimension, which currently defies a field-theory description.

  14:00 Tetsuo Deguchi (Ochanomizu University)
  Quantum state of a dark solition

- **Friday, May 4, 2018**
  11:00 Martin Ganahl (TU Graz)
  New methods for continuous matrix product states

  Over the past several years, continuous Matrix Product States (cMPS) have emerged as a powerful tool for obtaining non-perturbative ground state and excited state properties of interacting quantum field theories in (1+1)d. At the heart of the cMPS lies an efficient parametrization of many-body wavefunctions directly in the continuum, that enables one to obtain ground states of QFTs in (1+1)d. In the first half of this talk I will give an introduction to the formalism of cMPS. In the second part, I will discuss new

variational optimization methods for cMPS, and will explain how so-called basis-spline functions can be combined with a cMPS parametrization. I will show some new results for systems without translational invariance, and will briefly explain how lattice MPS methods can be utilised within the framework of cMPS calculations.