"Non-equilibrium dynamics"
of the programme "Quantum Paths"
April 16 – 20, 2018
Abstracts

- **Tuesday, April 17, 2018**
  11:00 Juan Garrahan
  Large deviations and "thermodynamics of trajectories" in open quantum systems

- **Wednesday, April 18, 2018**
  11:00 Sebastian Will
  Quantum Control of Ultracold Dipolar Molecules

  IUltracold molecules are poised to open new routes for precision measurements, quantum information, and many-body quantum physics. Quantum control over molecular ensembles and internal states of individual molecules is a prerequisite for advances in all these directions.
  In the first part, I will talk about our recent work on coherent control of ultracold NaK molecules at MIT. Starting with spin-polarized molecular ensembles, we demonstrate coherent coupling into excited rotational states. Furthermore, we demonstrate that superpositions of molecular hyperfine states can display coherence times on the scale of one second – a result that holds promise for precision spectroscopy and quantum information processing with molecules. In the second part, I will talk about our work at Columbia University that is geared towards strongly correlated phases of dipolar molecules in two dimensions.

- **Thursday, April 19, 2018**
  11:00 Jerome Dubail
  Hydrodynamics of 1d bosons with delta repulsion in the Quantum Newton Cradle setup

  Describing and understanding the motion of quantum gases out of equilibrium is a tremendous challenge for theorists. In 2006, the groundbreaking Quantum Newton Cradle experiment [1], where it was observed that two 1d clouds of cold atoms bounce against each other indefinitely without relaxation, provided impetus for many developments on the effects of low dimensionality in out-of-equilibrium quantum physics. But it is only thanks to the breakthrough of Generalized HydroDynamics (GHD) in 2016 [2] that one now possesses the adequate tools for an effective large-scale description of that experiment [3]. The purpose of this talk will be to give an introduction to those recent theoretical advances.

  Refs:
  [1]Kinoshita, Wenger and Weiss, Nature 440, 900, 2006
  [2]Castro-Alvaredo, Doyon and Yoshimura, PRX 6, 041065, 2016 and Bertini, Collura, de Nardis and Fagotti, PRL 117, 207201, 2016
  [3]Caux, Doyon, Dubail, Konik, Yoshimura, arXiv:1711.00873"