2020 SYMPOZJUM MŁODYCH NAUKOWCÓW WYDZIAŁU FIZYKI UW

24-28 SIERPNIA

„Nonequilibrium dynamics of persistent random walks”

Prof. Richard Blythe

School of Physics and Astronomy, University of Edinburgh

A random walk models the physical process of diffusion, where a particle is agitated by a surrounding fluid and exhibits a random motion. If a set of diffusing particles interact via hard-core repulsion nothing very interesting happens: these particles form a gas. On the other hand, if there are internally driven - for example, if they are living microorganisms that consume energy to propel themselves - different phases can form. A simple model for an internally-driven particle is the persistent random walk: that is, one which has some memory of its current direction, albeit one that is randomised over time. In this talk, I will show that when such particles interact, time-reversal symmetry is broken which means that this kind of memory is fundamentally different to inertia (which preserves time-reversal symmetry). I will also show that this has nontrivial effects on both the statics and dynamics of interacting particles. Specifically, one finds an effective short-range attractive interaction (despite the particles being repulsive without driving), a dynamical transition as the rate of directional randomisation is varied and a massive degeneracy in the relaxation spectrum at an exception point (a phenomenon that also arises in open quantum systems).

Koło Naukowe Nanorurki

WYDZIAŁ FIZYKI UNIWERSYTET WARSZAWSKI