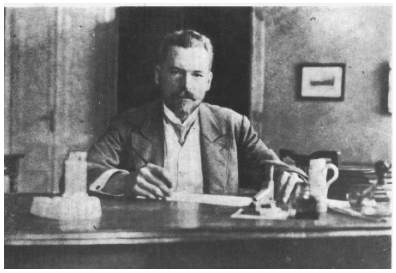

Contribution ID: **6** Type: **Talk**

Single particle diffusion in periodic potentials

Thursday, 19 September 2019 10:40 (20 minutes)

We calculate the time-dependent probability distribution function (PDF) of an overdamped Brownian particle moving in a one-dimensional periodic potential energy $U(x)$. The PDF is found by solving the corresponding Smoluchowski diffusion equation. We derive the solution for any periodic even function $U(x)$ and demonstrate that it is asymptotically (at large times t) correct up to terms decaying faster than $1/t^{3/2}$. As part of the derivation, we also recover the Lifson-Jackson formula for the effective diffusion coefficient of the dynamics. The derived solution exhibits agreement with Langevin dynamics simulations. The approach is generalized for inhomogeneous systems where, in additional to the periodic potential, the particle also experiences a periodic diffusion coefficient. The application of a one-dimensional (Fick-Jacobs) diffusion equation for describing Brownian dynamics in periodic corrugated channels is also discussed.

Summary

Primary author: FARAGO, Oded (Ben Gurion University)

Presenter: FARAGO, Oded (Ben Gurion University)

Session Classification: Session 2