Memory effects in confined colloidal motion

Arthur Straube [1] **and Felix Höfling** [2]

[1] *Modeling and Simulation of Complex Processes, Zuse Institute Berlin, Germany*
[2] *Department of Mathematics and Computer Science, Freie Universität Berlin, Germany*

Generalized Lagevin equations (GLEs) have proven as useful models to reduce the complexity of a system, by incorporating a large number of irrelevant degrees of freedom into a memory kernel. A formidable challenge is parameterizing the GLE from observations of such a complex system, that is estimating the memory kernel from simulation or experimental data. We have recently developed a general method to estimate memory functions from the mean-square displacement (MSD) as sole input [1], combining representations in the time and frequency domains. Further, while the mainstream of studies utilizing the GLE formalism tacitly implies the presence of inertia, colloidal systems belong to a wide class of strongly overdamped systems. In this contribution, I will show how our method [1] can be adjusted for an overdamped system and provide an analytically tractable example for a colloidal particle confined to a periodic energy landscape. The gained insights can be important for understanding from the perspective of non-Markovian dynamics active colloidal propulsion over periodic geometry landscapes [2] as well as passive colloids in (or driven over) periodic energy landscapes [3,4].

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