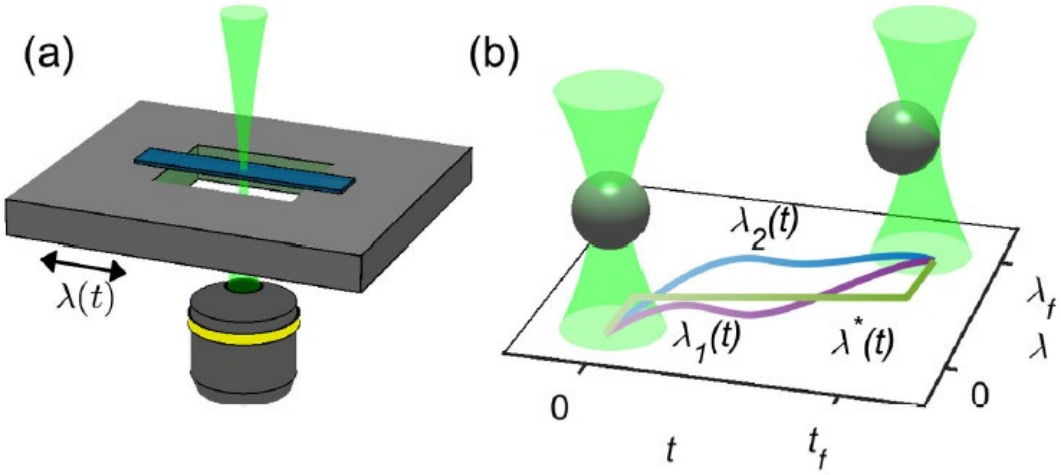
Physikalisches Institut
Fakultät für Mathematik und Physik
Albert-Ludwigs-Universität Freiburg

PHYSIKALISCHES KOLLOQUIUM

AM 30. JUNI 2025 UM 16 UHR C.T.
IM GROßEN HÖRSAAL



BROWNIAN PARTICLES IN NON-EQUILIBRIUM BATHS

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The behavior of classical and quantum systems is profoundly shaped by their surrounding environment. Traditionally, this environment is modeled as an idealized, infinite heat bath that instantly relaxes to equilibrium. However, when the bath's relaxation time is comparable to that of the system, this assumption breaks down. In such cases, the bath is driven out of thermal equilibrium and the system is subjected to nonequilibrium fluctuations. In my talk, I will experimentally and theoretically explore the consequences of this regime using the example of a colloidal particle in a complex fluid. We observe striking phenomena, including accelerated hopping across energy barriers, a memory-induced Magnus force on rotating particles, the emergence of unexpected symmetries in optimal finite-time protocols and nonmonotonic relaxations behaviors. Our findings align closely with general models incorporating time-delayed bath responses, suggesting that these effects may be universal across a broad class of systems.