SYBM 1 SYBM

Zeit: Dienstag 10:30–13:00 Raum: TU HE101

Hauptvortrag SYBM 1.1 Di 10:30 TU HE101

Forms and scaling in diffusion-limited growth: lightning, crystals, rivers, and tumors — •Leonard M. Sander — University of Michigan

Unstable diffusion limited growth, i.e, the coalescence of random walkers, gives rise to intriguing shapes which often show scaling properties. A simple computer model, Diffusion-Limited Aggregation, can describe the overall features of these shapes. Applications of this sort of description to are remarkable in their variety. For example the similar scaling is evident in dielectric breakdown patterns, random crystallization, some river networks, and biological patterns such as the shape of tumors.

Hauptvortrag SYBM 1.2 Di 11:00 TU HE101

From Maxwell demon to Brownian motor — •Christian Van den Broeck — Limburgs Universitair Centrum

Can one rectifie thermal fluctuations by operating on a microscopic level? This question, first posed by Maxwell, has become very relevant in view of the advances in nanotechnology. In his lectures, Feynmann argues on the basis of a specific construction, called the ratchet with pawl, that rectification is only possible if the device is in contact with two reservoirs at different temperature. However his conclusion that one can, in this case, reach Carnot efficiency however turns out to be flawed.

We argue that the Feynmann construction is unnecessarily complicated. We present a fully microscopic model, involving only hard core interactions, that can be simulated very accurately with molecular dynamics, and that can be solved analytically by a perturbation expansion in the limit of dilute gases.

Reference: C. Van den Broeck, R. Kawai, and P. Meurs, Microscopic Analysis of a Thermal Brownian Motor, Phys. Rev. Lett. 93, 090601 (2004)

Hauptvortrag SYBM 1.3 Di 11:30 TU HE101

How Biology breaks down Einstein's relation — •Jaques Prost — Ecole Supérieure de Physique et de Chimie Industrielles, Paris

One of the most important feature of Einstein analysis of Brownian motion, is the existence of a simple relation linking the diffusion contant of a particule to its friction coefficient. It's generalization to more complex systems is the fluctuation dissipation theorem. I will review the different forms which living systems may use to break this theorem and how this breaking is related to biological function. The different developed examples will include molecular motors, out of equilibrium membranes and sensory systems.

Hauptvortrag SYBM 1.4 Di 12:00 TU HE101

Colloidal Suspensions as Brownian Computers — •Clemens Bechinger — Universität Stuttgart

Frequently, the understanding of complex physical or biological situations requires intricate numerical simulations. An alternative approach is the application of colloidal suspensions, i.e. mesoscopic particles which are suspended in liquids. Since colloids are driven by the Brownian motion and thus rapidly sample their accessible configurational space they can be regarded as Brownian computers. We present two examples where the versatile use of colloidal systems is demonstrated: the first one is on the experimental realization of a recently proposed ratchet cellular automaton which is suggested as an alternative element in future computing devices. Secondly, we demonstrate the strain induced domain formation in two-dimensional colloidal suspensions on triangular substrates.

Hauptvortrag SYBM 1.5 Di 12:30 TU HE101

Photon random walks and beyond — •Georg Maret — Universität Konstanz

Light propagation in turbid media is often described by a simple random walk of photons. However, interference effects generate large deviations from this picture giving rise to speckles and coherent backscattering. These phenomena provide not only a wealth of information on the scattering medium itself, but may cause profound changes in the photon transport, ultimately ending up possibly in light localization. Our recent experimental progress on these issues will be reviewed.