BIO CITY LEIPZIG
Biotechnologisch-Biomedizinisches Zentrum

UNIVERSITÄT LEIPZIG

From Soft Condensed Matter Physics to a Brain in the Bottle

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The research group's general theme is the investigation of the physical properties of membranes and biopolymers. Current interests are focused on the plasma membrane and the cytoskeleton, which make up a large part of the functional modules of cellular systems. The components of these two highly enmeshed cellular building blocks belong – from the physicist's point of view – to soft condensed matter. In the living cell, this matter is often far from equilibrium and also behaving in a nonlinear manner. To understand the physical behavior of cells it is the research group's aim to contribute to the new field of Biological Physics. Concepts used in this field include novel statistical physics combining non-linear dynamics, liquid crystal and polymer physics. The team's current research projects deal with

1. active and passive actin networks

2. active and passive biomechanics

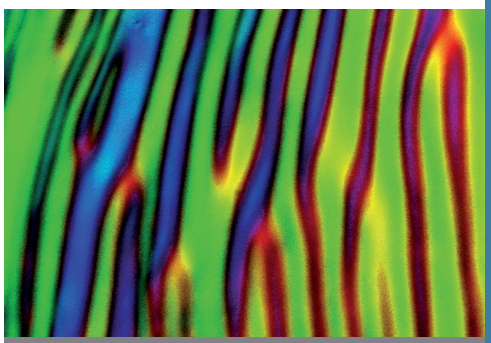
3. optomolecular control of the cytoskeleton

4. signal transduction in the plasma membrane.

The group employs methods of biochemistry, molecular biology, cell biology, laser physics, optics, nanoscience and microfluidics. The investigations are expected to not only give an improved picture of the living world but also to progress in understanding and description of fundamental subjects such as active polymer networks and physics far from equilibrium, and of processes such as the interaction of light with soft matter, cell motility, mechanotransduction, and the diffusion in inhomogeneous energy landscapes. Possible applications of the research lie in the development of diagnostic devices utilizing cell elasticity as a cell marker, the establishment of controlled neuronal network and the use of biomimetic machines.

Keywords

- **Soft Condensed Matter**
- **Biopolymers**
- **Cell Elasticity**
- **Neuronal Networks**
- **Biomimetic Nanosystems**



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BIOMEDICAL AND CELL ENGINEERING

Selected References

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