



# SONDERKOLLOQUIUM

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IM SEMINARRAUM, GUSTAV-MIE-HAUS



**The role of physics in design of functional materials  
at the interface with biomimetics:  
The case of adhesion**

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The existence of living matter is based on the defiance of equilibrium while maintaining order at the expense of energy consumption. This makes the cell a prime example of an active system that plays a pivotal role in the development of non-equilibrium physics. Due to their softness, cells exhibit strong fluctuations that are typically comprised from a thermal and an active component. While it is becoming conceptually clear that these fluctuations are coupled to the driving of biological processes, their physiological role remains widely unknown. One reason for this lack of clarity is that both the measurement of fluctuations, and the determination of their relation to a particular biophysical process, remains a significant challenge. It is precisely this challenge that is tackled in my group across several different systems. Using the example of cell adhesion, I will show how recent experimental advances in measuring cell-surface undulations can be combined with experiments in mimetic systems and multiscale modelling to demonstrate that active fluctuations of cells can be harnessed for the control of protein transport and adhesion during mechanosensing and tissue growth. Furthermore, I will apply concepts identified in these biological systems to design and model functional solid-liquid interfaces and particles with specific optical properties. In doing so I hope I will demonstrate the competitiveness of my research program and its complementarity to the activities of the Physics department at the University of Freiburg.