BIOMAC–BP Seminar Series

Time: **July 29, 2026 (Wednesday)**
3 PM CET

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Bio:
Carsten Beta received his PhD with Gerhard Ertl at the Fritz Haber Institute of the Max Planck Society in 2004, completed a postdoc with Eberhard Bodenschatz in Cornell and Göttingen and moved as a faculty member to the University of Potsdam in 2007 where he became a full professor in 2017. He heads a Biological Physics Lab that combines quantitative experiments with theoretical approaches to uncover the physical principles underlying cell motility. His experimental research focuses on the locomotion and collective behavior of both eukaryotic cells and bacteria, employing advanced optical microscopy and microfluidic technologies to study cellular dynamics in controlled environments. Complementing these experimental efforts, theoretical research in his group spans a broad range of topics, including random walk and active matter models, nonlinear dynamics, and pattern formation in reaction–diffusion systems.

Swimming strategies of polarly flagellated bacteria in complex environments

Bacterial motility is key to a wide range of phenomena, including the spreading of infectious diseases and the formation of biofilms. Most of what we know about bacterial swimming today is based on studies of the intestinal bacterium *Escherichia coli* that moves in straight runs interrupted by turning events. While *E. coli* relies on one swimming mode only, where a bundle of helical flagella pushes the cell body forward, other species exhibit more complex motion patterns. For example, the polarly flagellated soil bacterium *Pseudomonas putida (P. putida)* exhibits push and pull modes and may also swim with its flagellar bundle wrapped around the cell body. How do the different swimming modes affect the spreading efficiency of a bacterial swimmer? Do they allow for more efficient navigation in complex natural habitats? Using *P. putida* as an example, we study the impact of different swimming modes on the chemotaxis strategy of a multi-mode swimmer and explore its navigation and spreading in complex polymer networks and under confinement. Along with our experimental recordings, we use active particle models and theoretical estimates based on a coarse-grained density description to interpret our findings.

References

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