Berlin Center for Studies of Complex Chemical Systems

Fritz-Haber-Institut der Max-Planck-Gesellschaft, Humboldt-Universität, Max-Delbrück-Centrum für Molekulare Medizin, Otto-von-Guericke-Universität Magdeburg, Physikalisch-Technische Bundesanstalt, Technische Universität Berlin, Universität Potsdam.

Seminar

Complex Nonlinear Processes in Chemistry and Biology

Honorary Chairman: G. Ertl.
Organizers: M. Bär, C. Beta, H. Engel, M. Falcke, M. J. B. Hauser, J. Kurths, A. S. Mikhailov, P. Plath, L. Schimansky-Geier, and H. Stark.

Friday, 7th June, 2013, 16:00 s.t.
Address: Richard-Willstätter-Haus, Faradayweg 10,14195 Berlin, U-Bahnhof Thielplatz (U3).

Matthias Theves
University of Potsdam

Swimming patterns of a polarly flagellated bacterium in open and confined environments

In the presence of a solid-liquid or liquid-air interface, bacteria can choose between a planktonic and a sessile lifestyle. Depending on environmental conditions, cells swimming close to the interface can irreversibly attach to the surface and grow into three-dimensional aggregates forming a differentiated community embedded in a polymer matrix (biofilm). We analyze individual trajectories from a swimming population of the polarly flagellated bacterium Pseudomonas putida during the early attachment and growth phase, both in the bulk fluid and in close proximity to a glass-liquid interface. In the bulk fluid, P.putida displays a bimodal turning angle distribution with a dominant peak indicating a run-and-reverse pattern. Between reversal events, the cell systematically alternates between two distinct propagation speeds. We present a simple random walk model that accounts for these features and successfully describes the macroscopic spreading of our cell population in the fluid. In the presence of a rigid boundary, cells experience an increase in swimming speed and angular velocity, while the basic swimming pattern remains unchanged. Furthermore, we extend our analysis to cells that interact with various arrangements of circular obstacles.

Information: Dr. Sergio Alonso, Tel. (030) 3481-7948, email: sergio.alonso@ptb.de