



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

Berlin Center for Studies of Complex Chemical Systems

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, January 9, 2015, at 16:15

Attention! Change of address: Technische Universität Berlin, Hardenbergstraße 36, 10623 Berlin, Eugene-Paul-Wigner-Gebäude EW 731

Dr. Fernando Peruani

Université de Nice - Sophia Antipolis, France

Collective motion in confined geometries

We study the collective effects in collections of active particles in confined geometries with reflecting (specular) boundary conditions. Our analysis reveals various remarkable macroscopic features induced by the existence of a confinement. It shows that the often-observed "boundary-following" effect is a collective effect that requires particles to exhibit a velocity alignment mechanism. In the presence of a ferromagnetic alignment, particles self-organize in such a way that entire system rotates either clockwise or counterclockwise. For nematic alignment and below the critical point, half of the particles rotate clockwise while the other half counterclockwise. Interestingly, close to the critical point we observe that rotational order competes with metastable macroscopic structures, which we call bridges. We show that for both alignment mechanisms, the onset of orientational order is associated to a density instability by which the reflecting walls act effectively as attractive.