Eugene Wigner Colloquium

joint event of GRK 1558 and SFB 910

Fernando Peruani

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"Towards a quantitative, physical approach of bacterial infections: Salmonella Typhimurium in the search of host cells"

Gastrointestinal infections occur by both, motile and non-motile pathogenic bacteria. The advantage and role played by bacterial motility in the infection process remain fundamental open questions. In order to shed light on these issues, we study an in vitro system with free swimming Salmonella Typhimurium (ST) and human T84 colonic epithelial cells sitting on the bottom surface of a cell chamber. The study reveals four main results. 1) ST swimming near a surface behave as chiral active particles with speed fluctuations. 2) It is shown that speed fluctuations are not of thermal origin, and thus arguably related to fluctuations in the motility apparatus. Importantly, these active fluctuations can account for up to 40% of the (two-dimensional) diffusion coefficients D. 3) It is found that within the same bacterial population, there exists a large range of inter-individual variability of the bacterial exploring capacity, with D ranging over four orders of magnitude. 4) It is shown that the average encounter time tau between ST and a host cell is a function of the motility parameters, with tau ranging over one order of magnitude within the same population and for the used experimental host cell densities. These results are of prime importance to a better understanding of the role of bacterial motility in the infection process and a step towards a quantitative and physical approach to bacterial infections.

Carsten Beta

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