PHYSICAL MATHEMATICS SEMINAR

Self-organised dynamics of curved and deforming active surfaces

ALEXANDER MIETKE

Massachusetts Institute of Technology
Max Planck Institute for the Physics of Complex Systems, Dresden, Germany
Max Planck Institute of Molecular Cell Biology and Genetics, Dresden, Germany

ABSTRACT:

The mechano-chemical self-organisation of biological morphogenetic processes arises from a feedback loop in which active forces, by inducing material flows and deformations, indirectly affect their own chemical regulation. To better understand the role of geometry and curvature during such processes, we employ the theory of active gels in complex geometries and develop analytical and numerical tools to solve the corresponding momentum balance equations on curved and deforming surfaces. Diffusive and advective transport processes can additionally redistribute molecules responsible for local stress generation within those surfaces, which resembles the interplay between active forces, the motion they generate and the effects this has on their own regulation.

After introducing the essential concepts, we will present examples where the interaction between curvature and self-organised active forces leads to interesting emergent behaviour and discuss the consequences this has for biological systems, for example the actomyosin cortex of animal cells. Our approach provides novel opportunities to explore different scenarios of mechano-chemical self-organisation and might help to better understand the role of geometry and shape as a regulating element in morphogenetic processes.

TUESDAY, FEBRUARY 12, 2019
2:30 PM – 3:30 PM
Building 2, Room 139

Reception following in Building 2, Room 290
(Math Dept. Common Room)

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