8-10 January 2018

From Active Matter to Complex Fluids

Château de Valrose, Nice, France

Scientific program and Organization:

Fernando Peruani, Univesity Nice Sophia Antipolis (FR)

Giorgio Volpe, University College London (UK)

Giovanni Volpe, University of Gothenburg (SE)

Alvaro Marin, University of Twente (NL)

Financially supported by :

COST MP1305
FLOWING · MATTER

COST
EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

COST
EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

COST MP1305
FLOWING · MATTER

Workshop “From Active Matter to Complex Fluids”

Organizers: Alvaro Marin, Giorgio Volpe, Giovanni Volpe, Fernando Peruani
Funding: COST Action Flowing Matter

workshop program

from	to	DAY 1	DAY 2	DAY 3
9:00:00 am	9:35:00 am	Frey, Erwin	Löwen, Hartmut	Speck, Thomas
9:35:00 am	10:50:00 am	contributed talks (1-6)	contributed talks (12-17)	contributed talks (23-28)
10:50:00 am	11:20:00 am	coffee break	coffee break	coffee break
11:20:00 am	11:55:00 am	Beta, Carsten	Simmchen, Juliane	Golestanian, Ramin
11:55:00 am	12:30:00 pm	Isa, Lucio	Gompper, Gerhard	Chaté, Hugues/Shi, Xiaqing
12:30:00 pm	1:05:00 pm	Durham, William	Sagues, Francesc	Bertin, Eric
1:05:00 pm	2:35:00 pm	Lunch	Lunch	Lunch
2:35:00 pm	3:10:00 pm	Stenhammar, Joakim	Lindner, Anke	Di Leonardo, Roberto
3:10:00 pm	4:10:00 pm	contributed talks (7-11)	contributed talks (18-22)	contributed talks (29-33)
4:10:00 pm	4:30:00 pm	coffee break	coffee break	coffee break
4:30:00 pm	5:05:00 pm	Pagonabarraga, Ignacio	Wilczek, Michael	Tuval, Idan
5:05:00 pm	5:40:00 pm	Sitti, Metin	Toschi, Federico	Polin, Marco

Contributed Talks

Monday 8th	Tuesday 9th	Wednesday 10th
Morning session	Morning session	Morning session
Micheline Abbas	*Robert Großmann*	*Massimiliano Rossi*
Dario Vincenzi	*Moritz Linkmann*	*Sanjay Kumar*
F. Alarcon Oseguera	*Emanuele Locatelli*	*Henry Christophe*
Alessandro Magazzu	*Tuğba Andaç*	*Massiera Gladys*
Arianna Bottinelli	*Daniel Strömbom*	*Maziyar Jalaal*
Mickael Bourgoin	*Thomas Voigtmann*	*Emiliano Perez Ipiña*
Afternoon session	Afternoon session	Afternoon session
Luis A. Gómez Nava	*Borge ten Hagen*	*Cesare Nardini*
M.L. Ekiel-Jezewska	*Jalpa Soni*	*Hossein Nili*
Thomas Franosch	*Mihail Popescu*	*Oleksandr Chepizhko*
Maria Helena Godinho	*William Uspal*	*Tyler Shendruk*
Giuseppe Gonnella	*Ron Shnapp*	*Christopher Trombley*

The titles and abstracts of invited talks, contributed talks, and posters are listed below in the order they appear in the program.

The motion of active particles, for example, bacteria or unicellular organisms, in nature occurs in crowded environments such that the walls, boundaries, and obstacles strongly influence the dynamics of the microswimmers. Here we present a generic model for a deterministic circular microswimmer in a disordered two-dimensional quenched random array of obstacles. The microswimmer moves in circular orbits between the collisions with the obstacles, and after colliding with an obstacle the microswimmer follows the obstacle's surface for some time before detaching again. The diffusivity of the system is studied via event-driven computer simulations for a wide range of obstacle densities and orbit radii. We find to phase boundaries of a conducting phase with an insulating and a localized phase. The phase behavior is investigated both close to these two transition lines, as well as deep in the conducting phase. The phase transitions correspond to critical phenomena with both an underlying static percolation transition, while the dynamic exponents reveal different universal classes. Furthermore, we find that the diffusivity grows with the density of obstacles up to a narrow region in the vicinity of the localization transition where it rapidly drops to zero.

Tyler Shendruk

Transitioning from Active Nematic Films to Mesoscale Turbulence in 3D Channels

Topological defects play an essential role in the disorderly flows of 2D mesoscale turbulence in active nematic fluids and have been observed in active films of microtubule/motor protein mixtures, dense suspensions of bacteria and monolayers of fibroblast and epithelial cells. However, despite their important and well-established dynamics in 2D, it is less clear what role topological disclinations play in 3D active flows. By numerically simulating an active nematic fluid confined between parallel plates, we characterize the transition from quasi-2D to confined 3D chaotic flows. At small heights, the active nematic exhibits effectively 2D mesoscale turbulence, with straight disclination lines that span the channel gap and interact as essentially 2D defects. Upon increasing channel height, we find that disclinations are susceptible to twist perturbations, which lead the activity to further contort the lines producing curvature and a transition to fully 3D chaotic flows. By defining an order parameter based on the conformation of the disclination lines, we characterize the transition to 3D mesoscale turbulence.

Christopher Trombley

Stationary states of charged particles settling under gravity in a viscous fluid

The classical description of the qualitative behavior of charged particles in a vacuum is contained in Earnshaw's Theorem which states that there is no steady configuration such that particles in a vacuum is stable to perturbations. It is shown by example that two charged particles settling in a fluid may have a configuration which is asymptotically stable to perturbations. Necessary and sufficient conditions for the existence of steady states are given and physically meaningful inequalities derived.