

"Collective movements across scales"

1. Organisateurs (avec affiliation, usuellement 2 ou 3 personnes) :

Aurélié Dupont, LIPhy, Grenoble
Carine Douarche, Laboratoire FAST, Orsay
Cécile Appert-Rolland, IJCLab, Orsay

2. Résumé de la thématique du minicolloque :

Collective movements are observed across scales from bacteria at the micron scale [1] to fish schools at the kilometer scales [2]. Coordinated motion emerges spontaneously at a scale larger than the local interactions between individuals. The ubiquity of this phenomenon raises interesting interdisciplinary questions [3] from statistical physics [4, 5] and hydrodynamics [6] to ethology, biology, sociology and now even robotics. At the scale of animals, the collective behavior based on individual agents with limited cognitive skills give rise to collective intelligence that has now become of interest to the field of artificial intelligence. On the modeling side, very simple rules can give rise *in silico* to collective effects: for instance, the alignment with close neighbors of particles moving at a constant absolute velocity give rise to a phase transition to a self-ordered motion [7]. While *in vivo*, very diverse interactions between individuals and with the physical environment (2D/3D, in liquid or in air, *etc.*) are the ingredients of collective dynamical patterns.

Various communities work on collective motion of active particles [8], driven either by the interest for a specific system (pedestrians, animals, bacteria, robots, *etc.*) or by the fundamental understanding of generic toy models, and using experimental, numerical or theoretical approaches.

Keywords: physics of living matter, active matter, complex systems, statistical physics, hydrodynamics

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