Seminar Labex MS2T
"Control of Technological Systems of Systems"
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at the UMR 7083 CNRS Gulliver laboratory, ESPCI, Paris(France)
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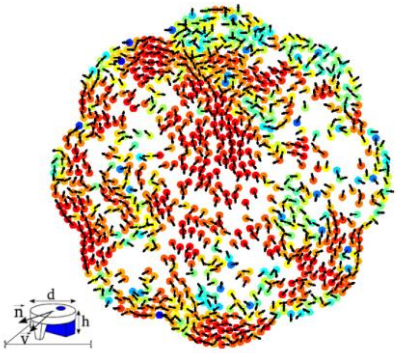
Collective motions of self propelled agents : from theory to experiments.

Abstract:

The ubiquity of collective motions observed at all scales in more or less complex situations ranging from the cooperative action of molecular motors to the behavior of large animal or human groups, has recently driven a surge of theoretical and numerical activity.

Within physics, most progress was achieved by studying microscopic point-particles models and their continuous descriptions.
Among the landmark results are the possibility of true long-range orientational order in two dimensions, the generic presence of strong, long-range correlations and/or spontaneously segregated dense and highly ordered nonlinear structures in moving, ordered, fluctuating phases. These numerical and theoretical results still largely lack experimental confirmation. This is mostly due to the fact that decisive experimental tests must be performed on large numbers of objects under controlled conditions.



In the present talk I will discuss several experimental systems starting from walking grains, moving to rolling colloids, and ending with swimming droplets. I will highlight the similarities and differences among these systems. In particular we will discuss the role of hard core repulsion, which is absent from most theoretical models. We will see that the collective behavior result from two emergent phenomena, one at small scale, the other one at large scale. I will conclude with a discussion about the possibility of harvesting energy in the form of a coherent work from such systems.

Short Bio:

Olivier Dauchot, is heading the recently founded research team EC2M (Collective effects in Soft Matter) within the CNRS Gulliver laboratory, at ESPCI, in Paris. His general interest is to develop model experiments for studying general features of many-particle systems, driven out of equilibrium. Developing collaborations with theoretical teams is one of his hallmark.
He presently concentrates on active matter, self-assembling, and glass forming systems. From 2005 to 2011, Olivier was leading the Group Instabilities and Turbulence in CEA-Saclay. At that time he brought significant contributions to the study of jamming in granular media as well as to that of chaotic mixing. During his PhD (1992-1995), and the immediate following years he contributed to the understanding of the subcritical transition to turbulence.

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