LadHyX Seminar – February 27, 10:45

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Flowing Active Suspensions: Plankton as a model active particle.

Suspensions of motile living organisms represent a non-equilibrium system of condensed matter of great interest from a fundamental point of view as well as for industrial applications. These are suspensions composed of autonomous units - active particles - capable of converting stored energy into motion. The interactions between the active particles and the liquid in which they swim give rise to mechanical constraints and a large-scale collective movement that have recently attracted a great deal of interest in the physical and mechanical communities. From the industrial point of view, microalgae are used in many applications ranging from the food industry to the development of new generations of biofuels. The biggest challenges in all these applications are the processes of separation, filtration and concentration of microalgae. There is therefore a real need for a better understanding of the flow of active material in order to ensure optimal control of these systems.

Our recent work on microalgae suspensions will be presented. The micro alga Chlamydomonas Reinhardtii uses its two anterior flagella to propel itself into aqueous media. It then produces a random walk with persistence that can be characterised quantitatively by analysing the trajectories produced. Moreover, in the presence of a light stimulus, it biases its trajectory to direct it towards the light: this phenomenon is called phototaxis. By coupling experiments and modelling, we propose to extract from the hydrodynamic characteristics of this microalga the generic properties of microswimmer suspensions.