# PHD CANDIDATE IN ACTIVE MATTER

LABORATORY :   Institut Lumière Matière

TEAM(S) :   LIQ@INT

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KEYWORD(S) :   colloids / mechanics / Active matter

SCIENTIFIC CONTEXT :

When describing the mechanical response of a solid at equilibrium, one can rely on three principles: energy conservation, symmetry of the response tensor, and Galilean invariance. It has recently been established that when the solid is made up of particles that inject energy into the system by spinning, none of these principles is verified. The mechanical response of the system is then highly anomalous, with a solid that can expand when rotated, or shear when compressed. The case where the solid is made up of self-propelled particles has been less studied. We know that there are modes of spontaneous

Dense monolayer of self-propelled colloids probed by magnetic microrheology

collective actuation, but we have no idea how such a solid would respond to mechanical stimulation.
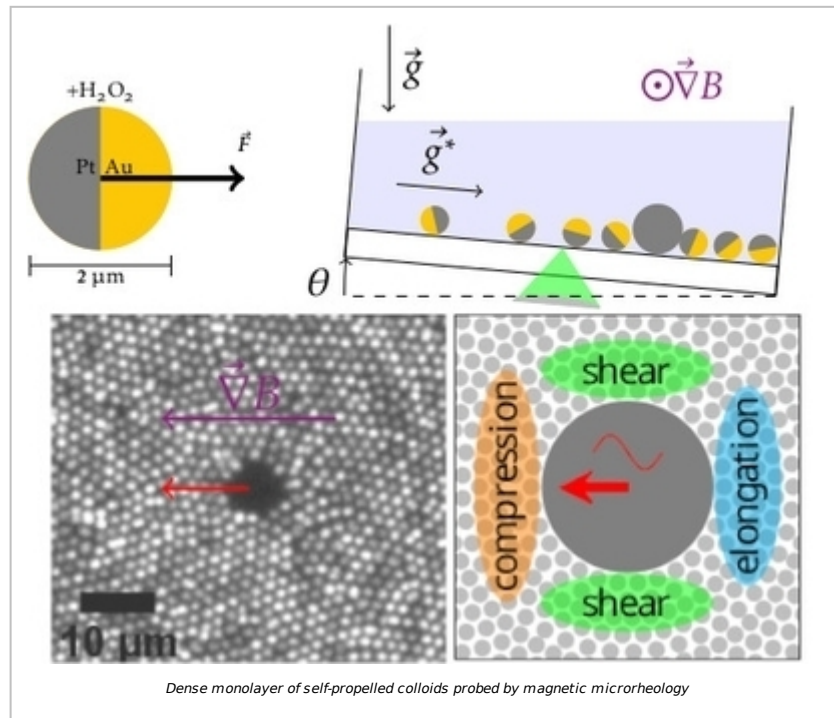
The aim of this thesis is to probe the mechanical response of a dense suspension of self-propelled colloidal particles. This system has been extensively studied in the host team.

This PhD thesis is fully funded by ANR and is part of a collaboration with experts in numerical simulations in Japan (possible research visits).

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MISSIONS :

In the course of this thesis, the candidate will develop a magnetic microrheology apparatus from an already available prototype. The application of a magnetic field to a magnetic bead immersed in the sample will exert known stresses, and optical microscopy of the displacements of the active particles will give access to the dynamic response tensor. In this way, the candidate will be able to characterize the anomalous response of the system in the elastic and elasto-plastic domains, as a function of the stress, but also of the activity or density of the system.

This project requires a strong background in soft matter physics, statistical physics or mechanics, a taste for experimental challenges, and a willingness to learn image and data analysis.

OUTLOOKS :

PhD diploma from University Lyon 1

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