CHIRAL READY
Chiral reactive and dissipative dynamics in a dual-beam optical trap

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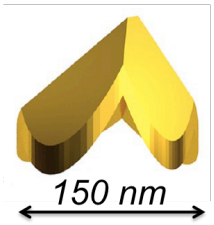
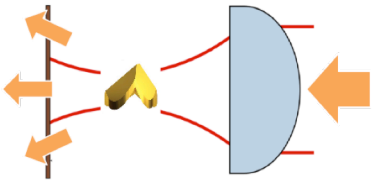
Chirality, the lack of mirror symmetry, is a pervasive concept in practically all disciplines in science. In chemistry, the connection between chirality and motion is an essential ingredient in the design of molecular machines [1]. In physics, chirality can be directly related to optical forces.

We revealed in [2] new optical forces that stem from the sole interaction between the chirality of matter and the chirality of the electromagnetic field and that separate into reactive and dissipative components. These forces are enantio-selective and polarization dependent and therefore lead to new all-optical schemes for chiral separation, as we detail in our recent review [3].

Yet, chiral optical forces have not been demonstrated at the nanoscale. This is the aim of this project, considering that reaching down the nanoscale is an important and pressing target. Indeed, the nanoscale draws a frontier where the molecular realm becomes accessible. Demonstrating nanoscaled chiral discriminatory schemes based on such new chiral optical forces has an obvious applicative potential.





The project will implement a novel strategy that consists in measuring chiral forces inside a dual-beam optical trap, specifically designed *(i)* to trap artificial chiral nanoobjects within polarization-controlled chiral optical landscapes [4] and *(ii)* to operate as a high-resolution chiral optical force microscope [5]. The aim is to unveil, separately, both reactive and dissipative components of the chiral forces that play a critical role in the design of new all-optical chiral discriminatory schemes.

We are looking for a candidate interested in nanophotonics, optical trapping and nanofabrication. She/he will use a large variety of spectroscopic and polarimetric tools specifically developed in the context of chiral light-matter interactions.

This project, involving multidisciplinary skills, will be performed at the Institut de Science et d'Ingénierie Supramoléculaires, CNRS-Université de Strasbourg, in collaboration with Prof. David J. Norris, ETH-Zurich, and Dr. Jeanne Crassous, ISCR, Rennes.

Useful references:

[1] S. Kassem et al., Chem. Soc. Rev. ***46****, 2592 (2017)*
[2] A. Canaguier-Durand et al., New J. Phys. ***15****, 123037 (2013)*
[3] V. Marichez et al., Soft Matter ***15****, 4593 (2019)*
[4] G. Schnoering et al., Phys. Rev. Lett. ***121****, 023902 (2018)*
[5] G. Schnoering et al., Phys. Rev. Appl. ***11****, 034023 (2019)*