Résumé (english)

Interactions between micro- or nanometric-sized entities and lipid membranes, acting as barriers at the cellular scale, govern many mechanisms occurring during phenomena ranging from viral infection and intercellular spread to drug delivery and cell exposure to microplastics. The deformation of these soft fluctuating membranes by a particle, either driven by an external force or by the particle's propulsion force, can lead to membrane shape transitions taking place in elementary biological processes such as endocytosis, even in the absence of biological machinery. In this thesis, the physical principles governing the shape transitions leading to endocytosis in a model system without specific interactions are investigated by driving the engulfment with optical tweezers or using active Janus particles.

Keywords: Optical tweezers, active Janus colloids, self-propulsion, lipid vesicles, engulfment, endocytosis