Dynamics of biological and bio-inspired systems: from single particles to suspensions

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This mini-colloquium aims to gather scientists interested in the dynamics of microscopic biological and bio-inspired structures in liquids. Such systems comprise soft vesicles and passive colloids under flows, self-propelled droplets and colloids, motile cells like micro-algae and bacteria or elongated flagella-like structures. These systems often display complex and rich behaviors from the interplay between externally-applied or self-generated flows and particles properties (e.g. deformation, anisotropy, activity, etc). We aim to present state-of-the-art understanding of such systems at the level of the single particles and of the collections of such particles in interactions, within experimental, numerical and theoretical approaches.
Examples range from red blood cells deforming under confined flows, in turn localizing within vessels and leading to what is known as margination (Fig. A), self-propelled Marangoni droplets (Fig. B) interacting together or with external flows, biological and synthetic micro-swimmers undergoing instabilities simply from their activity (i.e. MIPS, Fig. C) or from their hydrodynamic interactions (Fig. D), or biological and synthetic cilia in viscous or complex liquids and the actuation of flows by these structures (Fig. E and F).
The goal of this mini-colloquium is to exchange about the complex dynamics that these systems can undergo and learn about the commonalities and differences there can exist between them, e.g. between hard and soft, isotropic and anisotropic or active and externally-actuated particles.

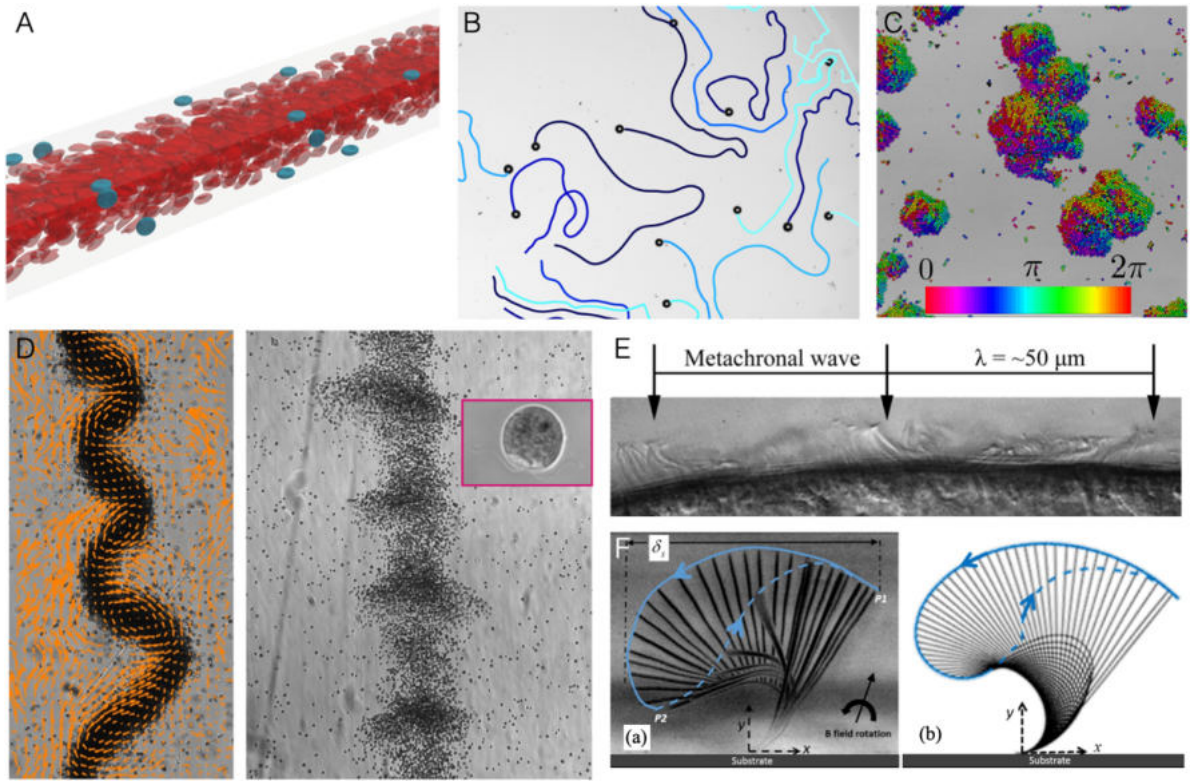

Figure. A. Simulations of soft (red) and rigid (blue) red blood cells in a square pipe. B. Self-propelled Marangoni droplets swimming on a glass coverslip. C. Self-propelled Janus colloids with aligning interactions undergoing interrupted Motility-Induced Phase Separation (MIPS) (from van der Linden *et al*, PRL, 2019). D. Motile micro-algae confined within a straight band destabilizing into a zig-zag structure or droplets. E. Metachronal wave in a flagella carpet on an epithelium (from Hanasoge *et al*, Lab Chip, 2017). F. Synthetic magnetic flagellum performing a breaststroke (from Rompolas *et al*, Mol. Bio. Cell, 2010).