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Water droplets also swim! MARJOLEIN VAN DER LINDEN, ZIANE IZRI, ESPCI ParisTech - CNRS, France, SÉBASTIEN MICHELIN, Ecole Polytechnique - CNRS, France, OLIVIER DAUCHOT, ESPCI ParisTech - CNRS, France — Recently there has been a surge of interest in producing artificial swimmers. One possible path is to produce self-propelling droplets in a liquid phase. The self-propulsion often relies on complex mechanisms at the droplet interface, involving chemical reactions and the adsorption-desorption kinetics of the surfactant. Here, we report the spontaneous swimming of droplets in a very simple system: water droplets immersed in an oil-surfactant medium. The swimmers consist of pure water, with no additional chemical species inside: water droplets also swim! The swimming is very robust: the droplets are able to transport cargo such as large colloids, salt crystals, and even cells. In this talk we discuss the origin of the spontaneous motion. Water from the droplet is solubilized by the reverse micellar solution, creating a concentration gradient of swollen reverse micelles around each droplet. By generalizing a recently proposed instability mechanism, we explain how spontaneous motion emerges in this system at sufficiently large Péclet number. Our water droplets in an oil-surfactant medium constitute the first experimental realization of spontaneous motion of isotropic particles driven by this instability mechanism [1].
[1] Z. Izri et al., PRL, accepted (2014), arXiv:1406.5950

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