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Droplet-based microfluidics and the dynamics of emulsions JEAN-CHRISTOPHE BARET, QUENTIN BROSSEAU, BENOIT SEMIN, XIAOPENG QU, Max-Planck Institute for Dynamics and Self-Organization, DROPLETS, MEMBRANES AND INTERFACES TEAM — Emulsions are complex fluids already involved for a long time in a wide-range of industrial processes, such as, for example, food, cosmetics or materials synthesis [1]. More recently, applications of emulsions have been extended to new fields like biotechnology or biochemistry where the compartmentalization of compounds in emulsion droplets is used to parallelise (bio-) chemical reactions [2]. Interestingly, these applications pinpoint to fundamental questions dealing with surfactant dynamics, dynamic surface tension, hydrodynamic interactions and electrohydrodynamics. Droplet-based microfluidics is a very powerful tool to quantitatively study the dynamics of emulsions at the single droplet level or even at the single interface level: well-controlled emulsions are produced and manipulated using hydrodynamics, electrical forces, optical actuation and combination of these effects. We will describe here how droplet-based microfluidics is used to extract quantitative informations on the physical-chemistry of emulsions for a better understanding and control of the dynamics of these systems [3].

[1] J. Bibette et al. Rep. Prog. Phys., 62, 969-1033 (1999)
[2] A. Theberge et al., Angewandte Chemie Int. Ed. 49, 5846 (2010)
[3] J.-C. Baret et al., Langmuir, 25, 6088 (2009)

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