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Oval track droplets racing to a circle: a generic behavior for confined droplets relaxation and a geometrical model[1] PIERRE-THOMAS BRUN, MATHIAS NAGEL, FRANCOIS GALLAIRE, EPFL / LFMI — Working in a Hele-Shaw cell, the ideal case of the relaxation of a flattened cylindrical droplet of apparent elliptical cross section is considered. Even though the typical Reynolds number imposed by the problem size is extremely low we found out that the investigated pancake droplet relaxes in a remarkable non-monotonous way. After a transient regime, where the droplet adopts a "peanut" shape, it relaxes among a novel family of ovals that to our knowledge has never been reported. These shapes, further referred to as κ_2 ovals, are recovered from geometrical constrains that arise from a linear stability analysis. Far from being limited to initially elliptical relaxing droplets the κ_2 ovals appear to be generic and are found in the relaxation of any initially symmetrical shape. This point is well understood thanks to the previously evoked linear stability analysis. A practical example of such relaxations is provided when considering the coalescence of two identical droplets. Experimental movies of FC40 oil droplets in a water continuous phase are provided. Coalescence is achieved in a PDMS micro-channel and the obtained images are used for comparison with our theoretical work.

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Pierre-Thomas Brun
EPFL / LFMI

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