Stage M2 et thèse financée

Traffic flows

Hundreds of natural and industrial processes ultimately rely on the transport of particle in fluidic networks. In stark contrast, from a fundamental perspective, very little is know about the traffic dynamics of particles cruising through heterogeneous networks (emulsions, suspensions, foams, etc). While hydrodynamic interactions in homogeneous fluids are very well established, the collective dynamics of particle advected in heterogeneous media is virtually unknown. Building on model microfluidic experiments and quantitative theories, we will rectify this situation. We will pay a special attention to random obstacle networks which are relevant to enhance oil recovery process. The traffic dynamics will be analyzed using stat. mech. concepts initially introduced in hard and soft condensed matter physics (Depinning of flux lines in type II superconductors, and avalanches granular media).

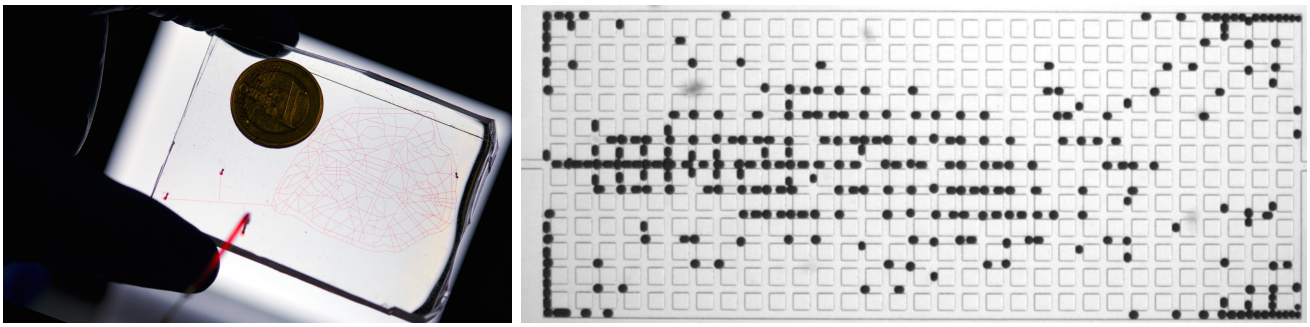

FIGURE 1 – Two microfluidic networks Left : The network geometry is that of the Paris street map. Right : Traffic of emulsion droplets drive through a periodic lattice of channels. Channel width 50 μm.

This fundamental project will be funded by TOTAL SA. **The PhD candidate will benefit from an industrial CIFRE fellowship, and the research will be performed at ENS de Lyon.** We are looking for a highly motivated candidate with a solid background in fluid mechanics, statistical mechanics and soft condensed matter physics, and willing to conduct research combining experiments and theory/numerical simulations.

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