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Droplet Traffic Control at a simple T junction PASCAL PANIZZA,
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A basic yet essential element of every traffic flow control is the effect of a junction where the flow is separated into several streams. How do pedestrians, vehicles or blood cells divide when they reach a junction? How does the outcome depend on their density? Similar fundamental questions hold for much simpler systems: in this paper, we have studied the behaviour of periodic trains of water droplets flowing in oil through a channel as they reach a simple, locally symmetric, T junction. Depending on their dilution, we observe that the droplets are either alternately partitioned between both outlets or sorted exclusively into the shortest one. We show that this surprising behaviour results from the hydrodynamic feed-back of drops in the two outlets on the selection process occurring at the junction. Our results offer a first guide for the design and modelling of droplet traffic in complex branched networks, a necessary step towards parallelized droplet-based “lab-on-chip” devices.

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