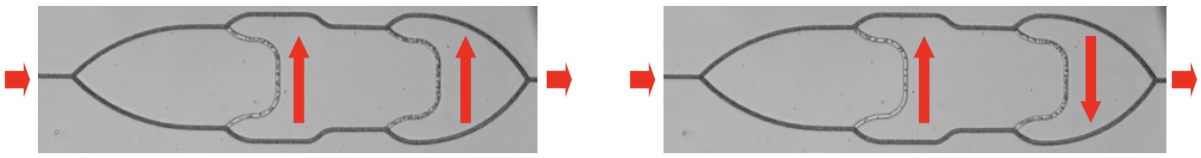
Post-Doctoral Position
«Spatio-temporal dynamics of microvascular networks»

Project summary

In the microcirculation, blood flows through a complex network of capillaries where the coupling between the local rheology and phase separation at bifurcations of the network is known to lead to strong heterogeneities of the red blood cell distribution. Theoretical predictions supported by preliminary experiments reveal the possibility of **multiple solutions and oscillatory states** for the distribution of particle concentrations and flow velocities in the different branches, even for relatively simple network geometries. In collaboration with theoreticians (Olin College and Babson College, MA, USA), we propose to experimentally investigate the spatio-temporal dynamics of suspension flows in microfluidic networks with a focus on **blood flows in model networks of capillaries**. Carefully designed microfluidic systems will be used to perform a systematic experimental investigation of the flow of red blood cell suspensions in simple, symmetric networks that have proven to be prone to multistability and symmetry breaking. The project aims at exploring the conditions leading to symmetry breaking, multiple flow configurations or oscillatory dynamical states in networks, especially through **controlled perturbations of the system** to assess the stability of the solutions and trigger transitions between multiple metastable states of the system.

Besides network geometry and flow conditions, blood composition and properties are essential parameters influencing rheology and red blood cell distribution at bifurcations, which in turn govern the global spatio-temporal dynamics of the network. **Aggregation properties** of red blood cells are such a parameter, that is affected by several pathologies. Their impact on the flow patterns in networks will receive a dedicated attention.



Different asymmetric flow patterns develop spontaneously in a symmetric network.

Location and practical aspects

The successful applicant will be affiliated to Laboratoire Rhéologie et Procédés (LRP) in Grenoble, France and the research will be conducted in both LIPhy and LRP laboratories on the same campus under the supervision of G. Coupier (LIPhy) and T. Podgorski (LRP).

The gross salary will be 2656 euros/months, equivalent to a net salary of 2134 euros/month.

Qualifications of the applicant

The applicant is expected to have a PhD with a strong experience in microfluidics, including chip design and fabrication as well as flow control and microscopy. He/she will also need to develop his/her own routines to analyse data and experience in image processing is an asset. Additional skills and knowledge in fluid dynamics, rheology and nonlinear physics are welcome

Applications

Interested candidates should send their CV and cover letter to thomas.podgorski@univ-grenoble-alpes.fr and gwennou.coupier@univ-grenoble-alpes.fr .

Deadline for the application: 30 september 2022

Tec 21
Laboratoire d'Excellence
+33(0)4 56 52 86 50
LEGI Bâtiment K - 1211 rue de la Piscine
Domaine Universitaire - 38 400 Saint Martin d'Hères
www.tec21.fr