UNIVERSITÄT BAYREUTH

Biofluid Simulation and Modeling
Theoretische Physik VI

MSc/BSc Project

Computational study of blood flow in the microcirculation

The microcirculatory network contains the smallest blood vessels which are most relevant for biological functions such as oxygen exchange or drug delivery. A fascinating phenomenon in the microcirculation is the spontaneous creation of highly pulsatile flow patterns. Such flows can appear when red blood cells temporarily get stuck at the apex of bifurcations and are then suddenly released back into the flow. This and many other related phenomena are still not fully understood.

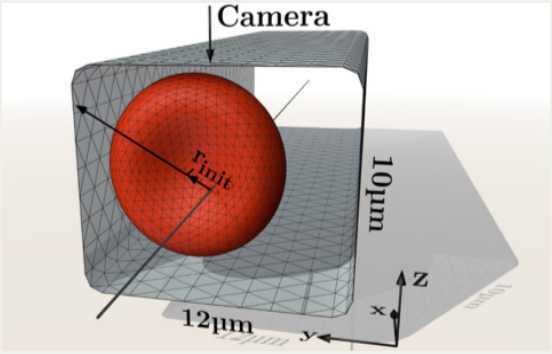

Fig. 1: Simulation of a red blood cell flowing through a microchannel

The overall goal of this project is to reach a systematic mechanistic understanding of the two-way-coupling between pulsating flow and red blood cell dynamics in the microcirculation using computer simulations in connection with experiments by our collaboration partners.

The project will use methods of computational fluid dynamics such as Lattice-Boltzmann and Immersed-Boundary. Simulations will be based on existing codes which will be extended by the prospective candidate. Analysis tools will be written by the candidate in C/C++. The required supercomputer ressources will be provided by the local computing cluster available at the University of Bayreuth as well as by projects on national supercomputing systems such as SuperMUC and JEWELS.

For applications or further information please contact *stephan.gekle@uni-bayreuth.de* or see our website *biofluid.physik.uni-bayreuth.de*