PhD Project

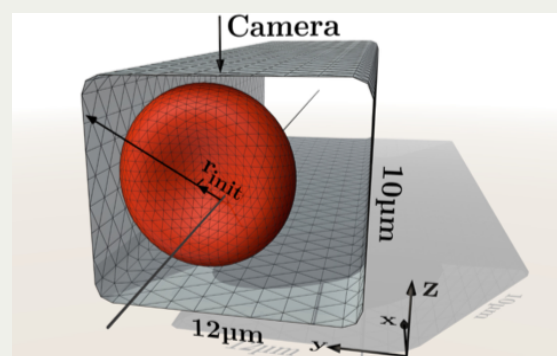# Computational study of pulsating blood flow in the microcirculation

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.

The overall goal of this PhD 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.

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

The PhD project is situated in the Theoretical Physics department and will use methods of computational fluid dynamics such as Lattice-Boltzmann and Immersed-Boundary. Simulations will be based on the existing ESPResSo code 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.

The successful candidate must possess a strong background in theoretical physics, numerical mathematics, computational engineering or a similar discipline. Good programming skills in C++ are required. A background in fluid mechanics is desirable, but not explicitly required. Research will be conducted in the Biofluid Simulation and Modeling group at the University of Bayreuth, Germany. Bayreuth is a medium-sized town with a fairly large student population and is situated in a beautiful natural setting between the mountains of *Fränkische Schweiz* and *Fichtelgebirge*.

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