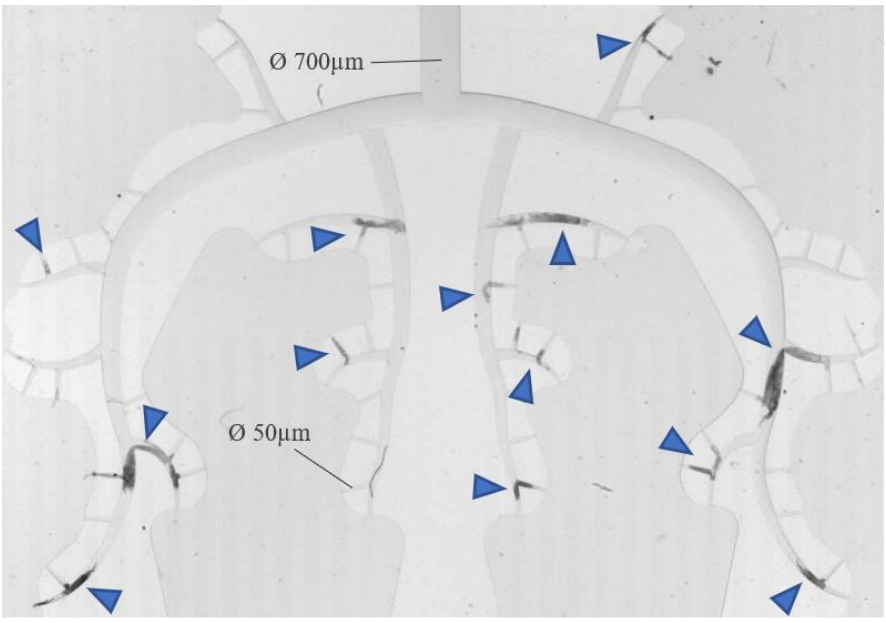
KTH SOLID MECHANICS SEMINAR; Thursday, January 29th, 16.15; https://kth-se.zoom.us/j/ 577 521 0342

Dominik Obrist
"Biomechanics of Coronary Microvascular Obstruction"

Coronary microvascular obstruction (MVO) is an injury of the myocardial microcirculation. It typically follows a heart attack after successful recanalization of the blocked coronary artery (primary occlusion). MVO leads to under-perfusion of the affected tissue and has a negative impact on patient outcome. It may be caused by microthrombi (debris from the primary occlusion) embolizing vessels of less than 200µm diameter. Presently, there is a lack of effective methods for the diagnosis and therapy of MVO. For the systematic study of the biomechanics MVO and to develop diagnostic and therapeutic approaches, we devised a multi-scale in vitro model of the coronary circulation. It comprises a microfluidic chip modeling vessels with diameters ranging from 700 to 50µm. MVO is induced by injecting human microthrombi (~200µm) into the microfluidic chip where they randomly distribute and occlude some of the microchannels. We will discuss the transport and distribution of the microthrombi in the microfluidic chip and will characterize their effect on the perfusion and the delivery of thrombolytic drugs toward the microthrombi. We will study the dynamics of thrombolysis in the chip and will show that microthrombi can be resolved after a primary incubation time of 90 seconds at high drug concentration over the course of 20 minutes.



Microfluidic chip with occluding microthrombi (blue arrows)

Dominik Obrist is Professor of Cardiovascular Engineering at the ARTORG Center for Biomedical Engineering Research at the University of Bern. He obtained a degree in mechanical engineering from ETH Zurich and earned his doctoral degree in 2000 at the Department of Applied Mathematics of the University of Washington. From 2000 to 2005, he worked at the supercomputer company Cray Inc. He returned to ETH Zurich in 2005, where he established a research group in biomedical fluid dynamics. He was appointed in Bern in 2013. His research focuses on turbulent blood flow, heart valve prostheses and microvascular diseases, and he is co-founder of several MedTech start-ups.