



From Silicon to Solutions: The Role of Chiptech in Modern Medicine

Albert van den Berg, University of Twente

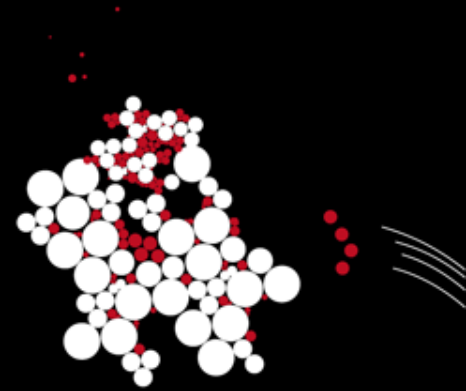
UNIVERSITY OF TWENTE.

Labs on Chip and Organs on Chip

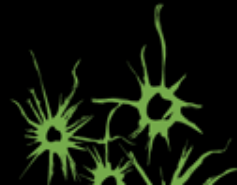
Albert van den Berg

BIOS/Lab-on-a-Chip group

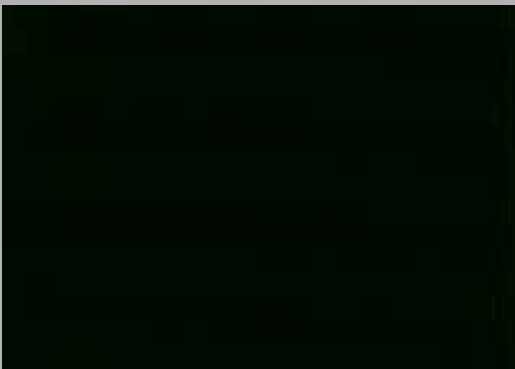
University of Twente, The Netherlands



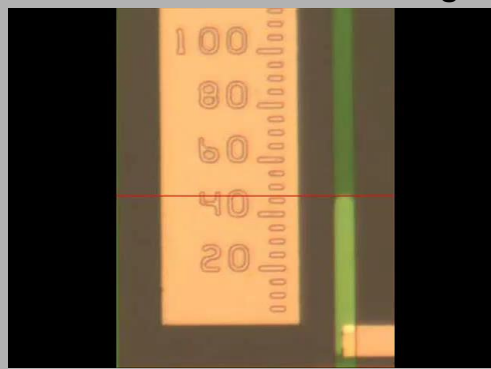
Techmed Event, November 6th, 2024



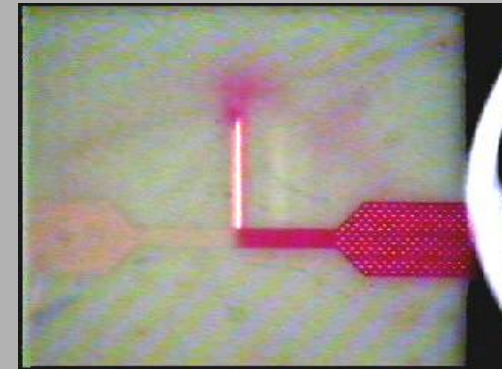
electrophoresis



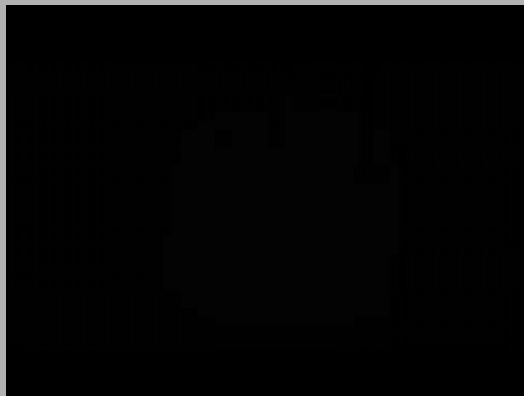
electrochemical fl dosing



FlowFET



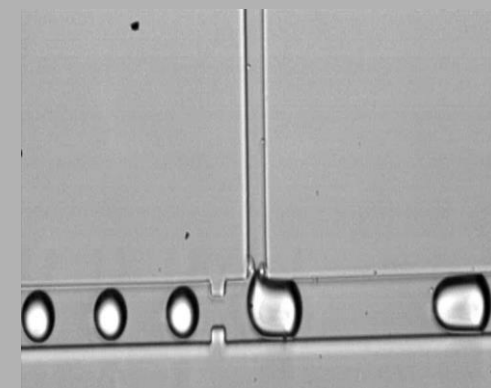
paper-based microfluidics



integrated microfluidics in PDMS



droplets in oil (200x slomo)

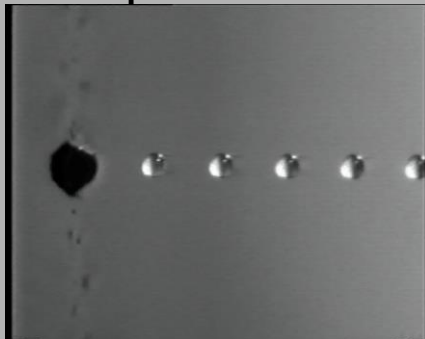


Whitesides

Quake

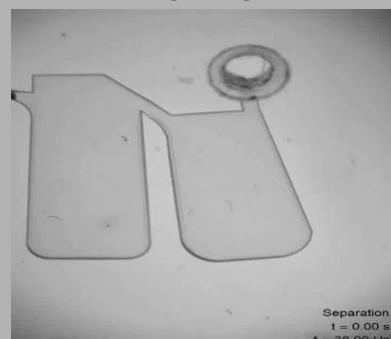
Weitz

droplets in air



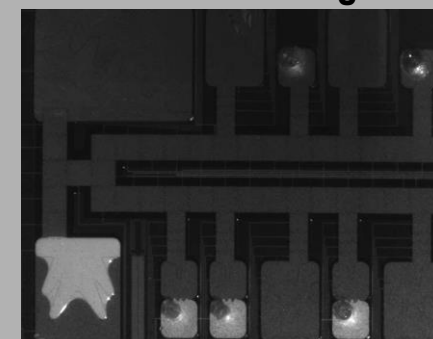
Laurell

centrifugal system



Zengerle

electrowetting

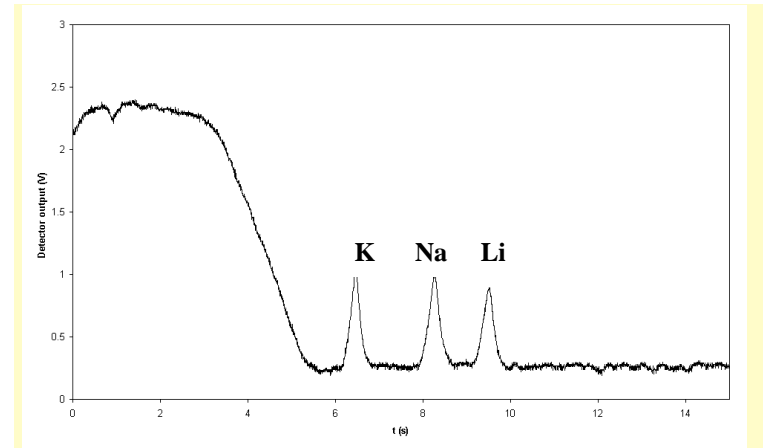
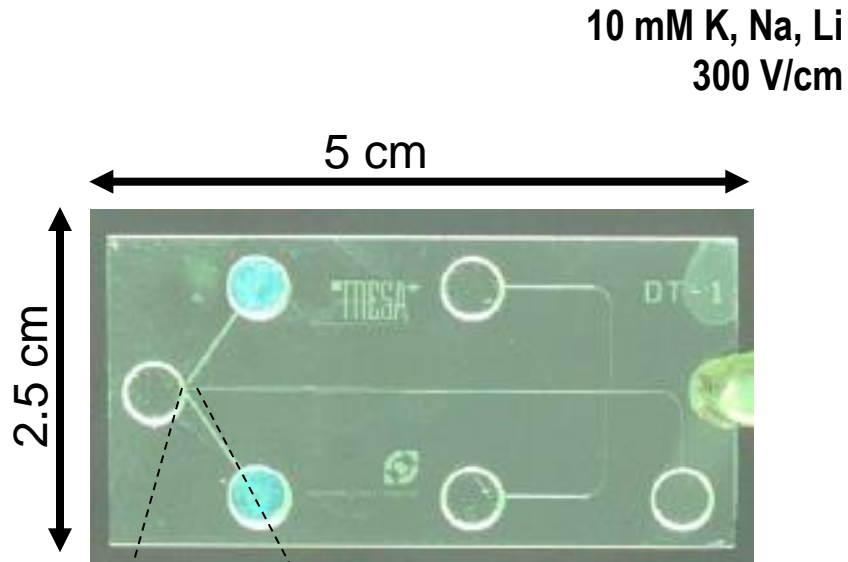


Delapierre

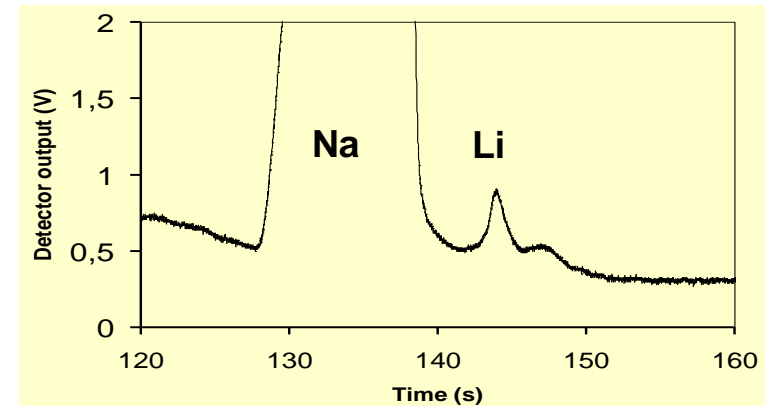


Separation
t = 0.00 s
f = 38.00 Hz

Lithium monitoring for manic depressive patients using CE



150 mM Na, 1 mM Li
300 V/cm

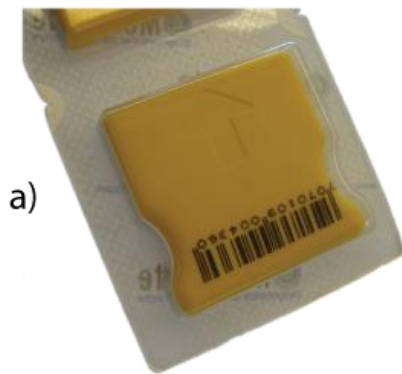


E.X. Vrouwe *et al.*, *Electrophoresis*, **26**, 3032-3042, (2005).

E.X. Vrouwe *et al.*, *Clin. Chem.*, **53**(1), 117-123, (2007).

A. Floris *et al.*, *Lab Chip*, **10**(14), 1799, (2010).

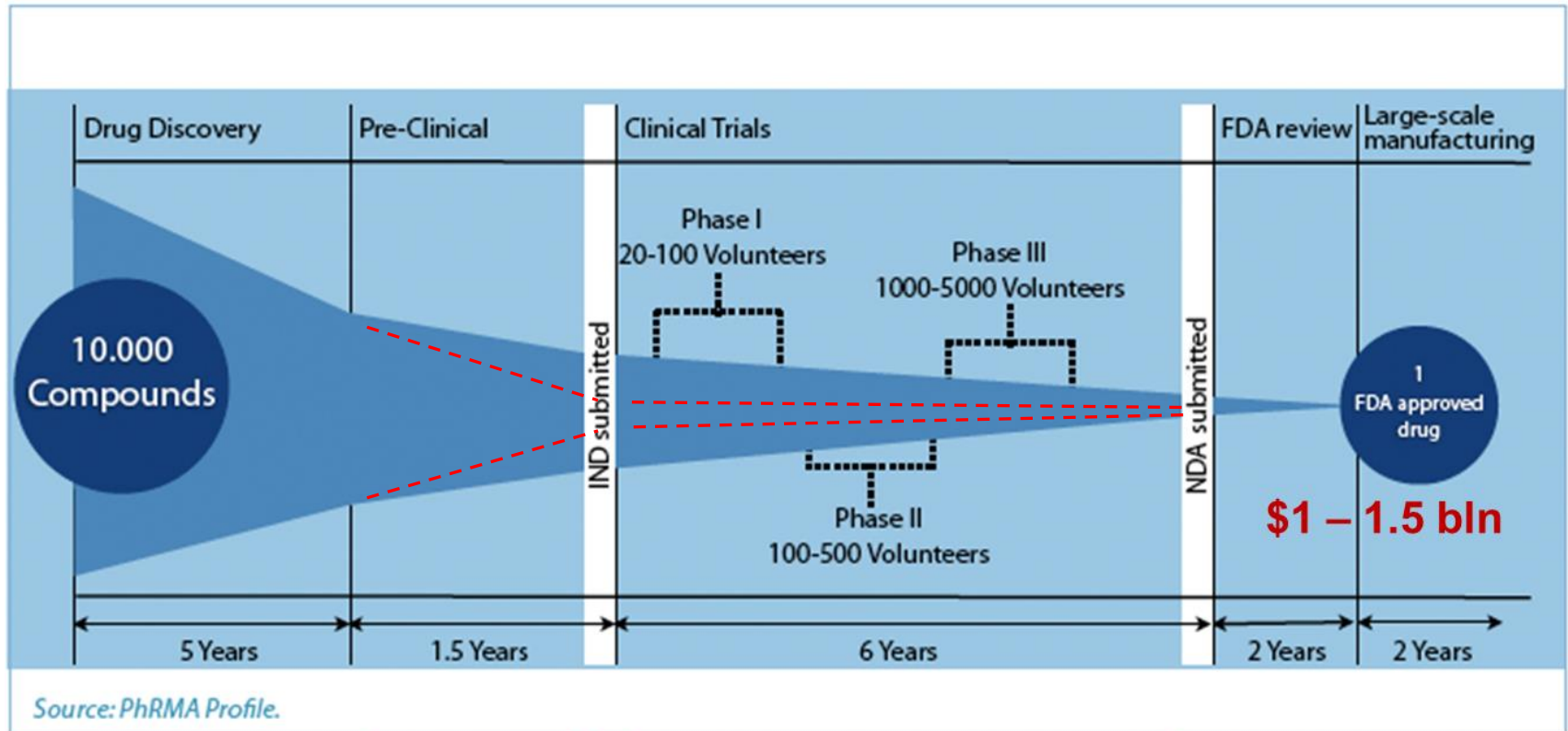
2 master students: spin-off



- prefilled, ready to use, disposable chip
- >50.000 produced so far



Drug development



Selecting/
prioritizing Animal
testing \$\$

Personalized medicine

Disease studies

Atherosclerosis chip

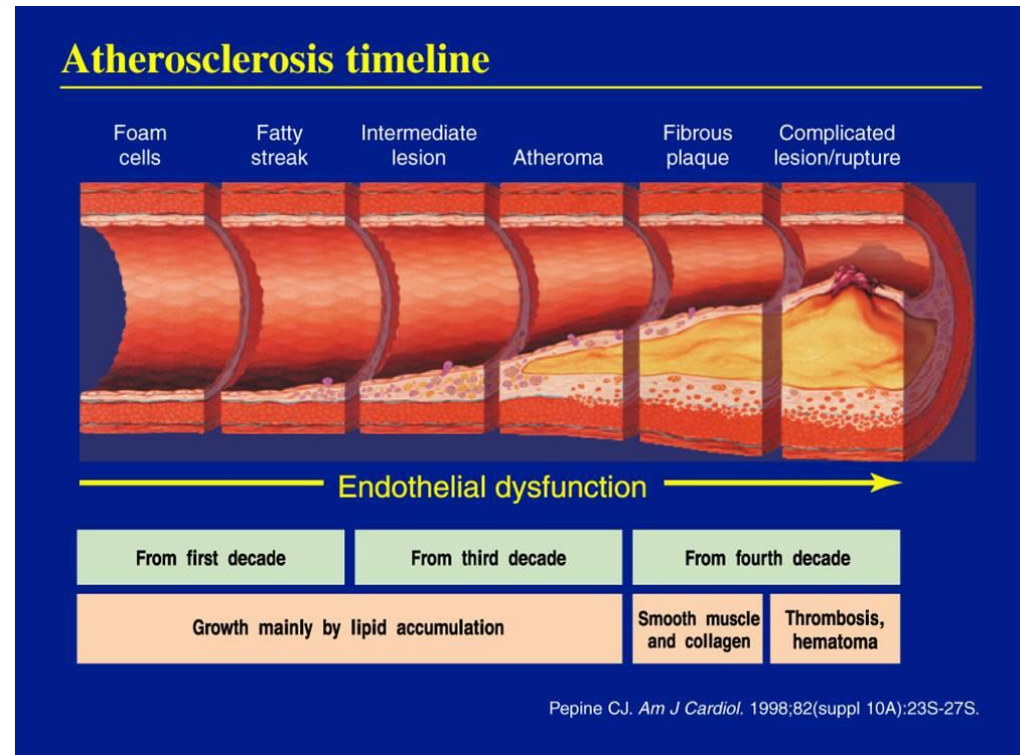


Andries van der Meer



Hugo Albers

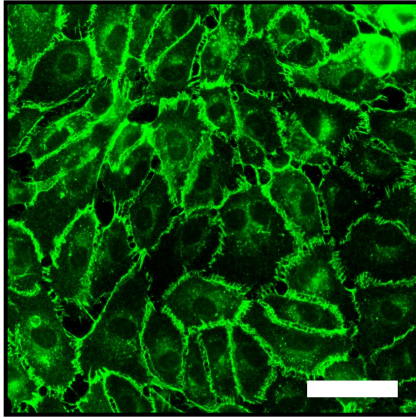
- Commonly referred to as hardening of the arteries. Characterized by plaque deposits that block the flow of blood.
- Plaques can rupture causing sudden formation of blood clot (thrombosis). Thrombosis can also occur without plaque rupture.



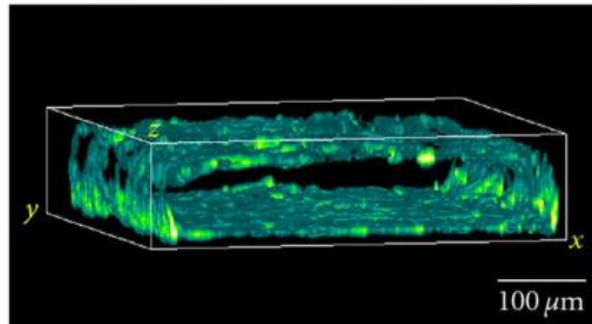
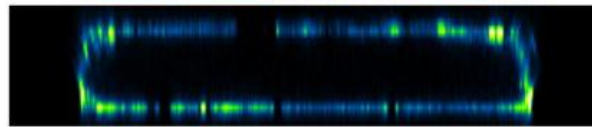
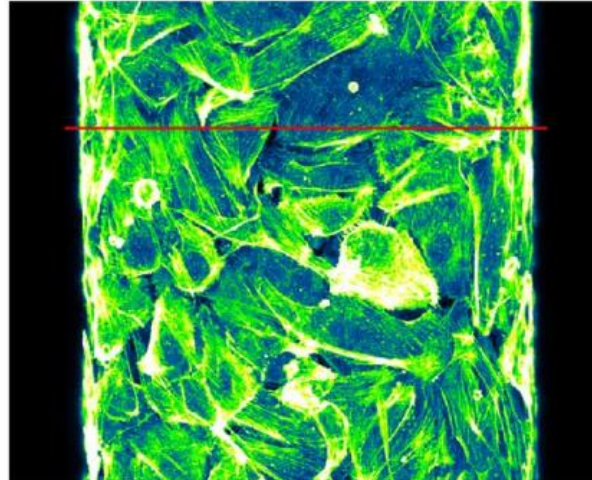
Outcome: CVD, CAD, PVD => Heart attack and stroke.

CAPILLARY-ON-A-CHIP

VE-Cadherin-FITC

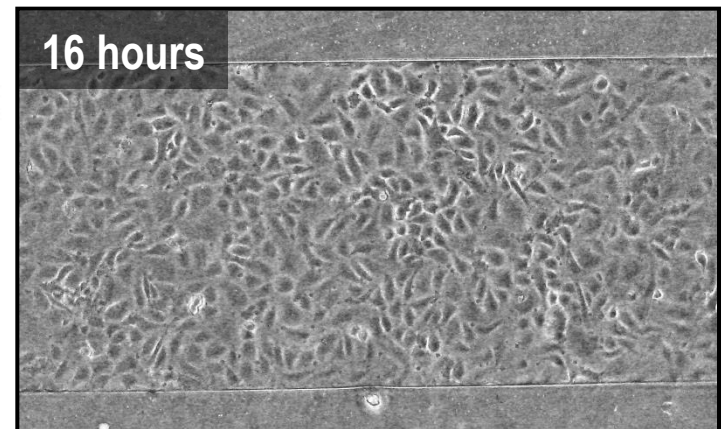
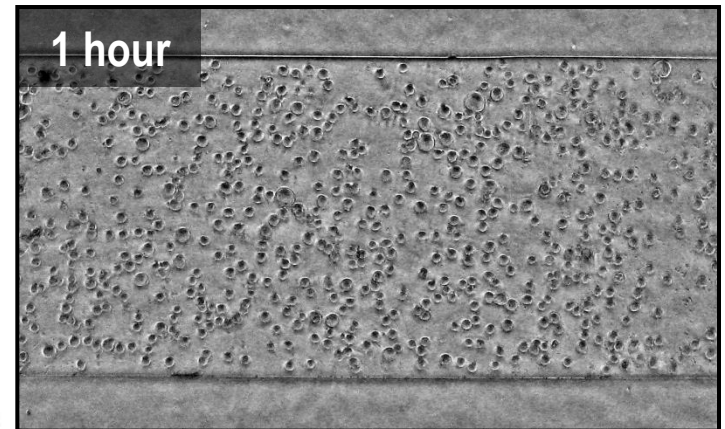


F-actin-FITC

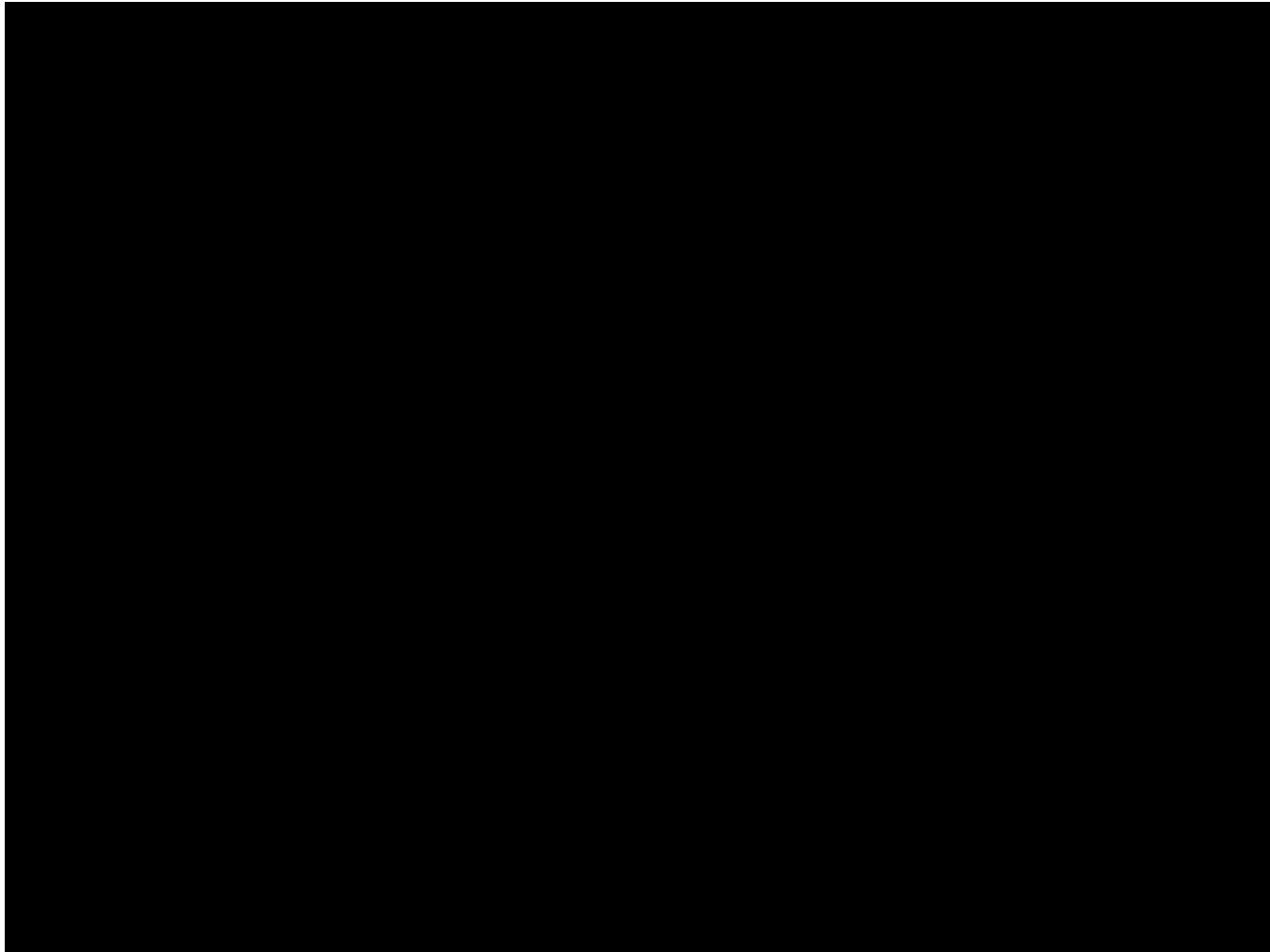


“Micrometer-sized capillary”

Human endothelial cells in a channel, with 500 μm width, 60 μm height



Blood perfusion: thrombus formation



E. Westein et al., PNAS, (2013).