Microfluidics for the World

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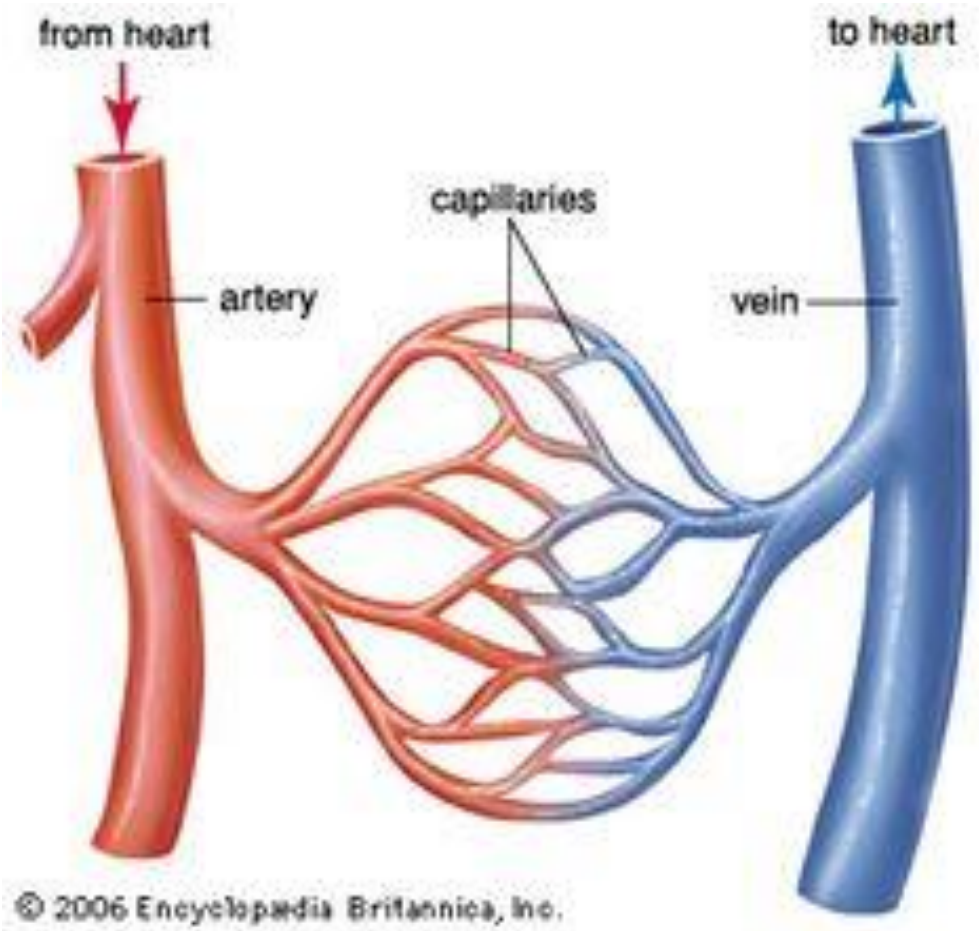
PATW- 2016


from heart
to heart
capillaries
artery
vein
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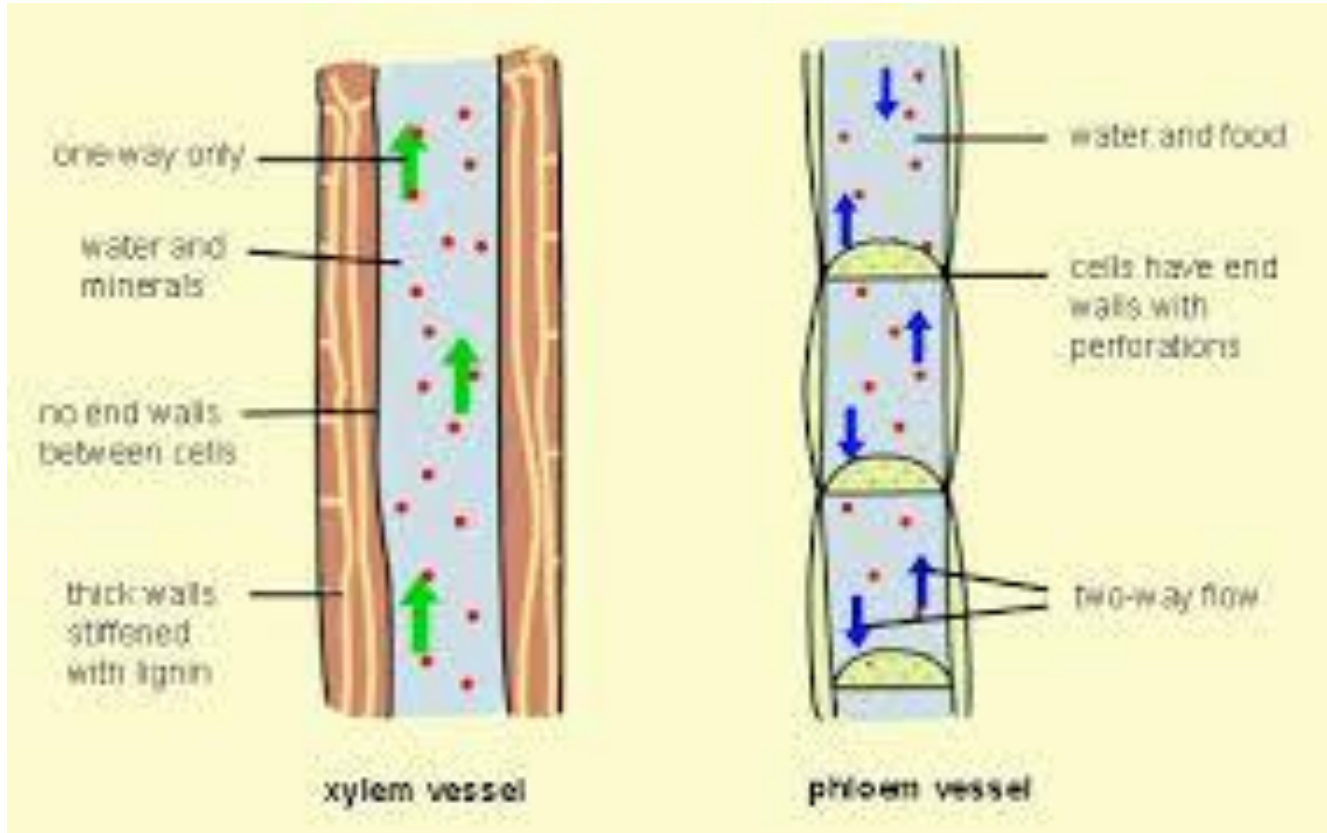
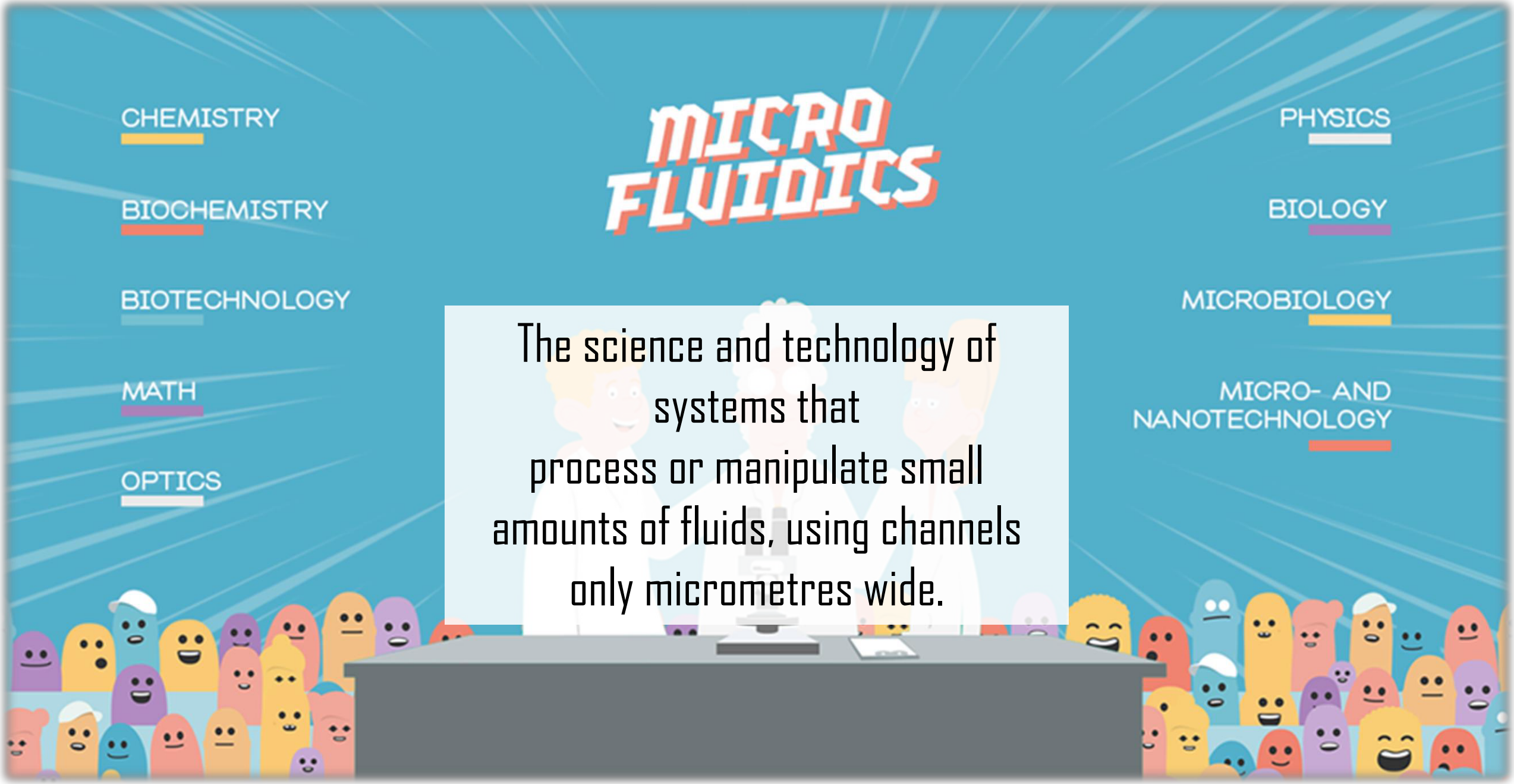

one-way only
water and minerals
no end walls between cells
thick walls stiffened with lignin
xylem vessel
water and food
cells have end walls with perforations
two-way flow
phloem vessel


CHEMISTRY
BIOCHEMISTRY
BIOTECHNOLOGY
MATH
OPTICS
MICRO FLUIDICS
PHYSICS
BIOLOGY
MICROBIOLOGY
MICRO- AND NANOTECHNOLOGY
The science and technology of systems that process or manipulate small amounts of fluids, using channels only micrometres wide.

Esoteric Details

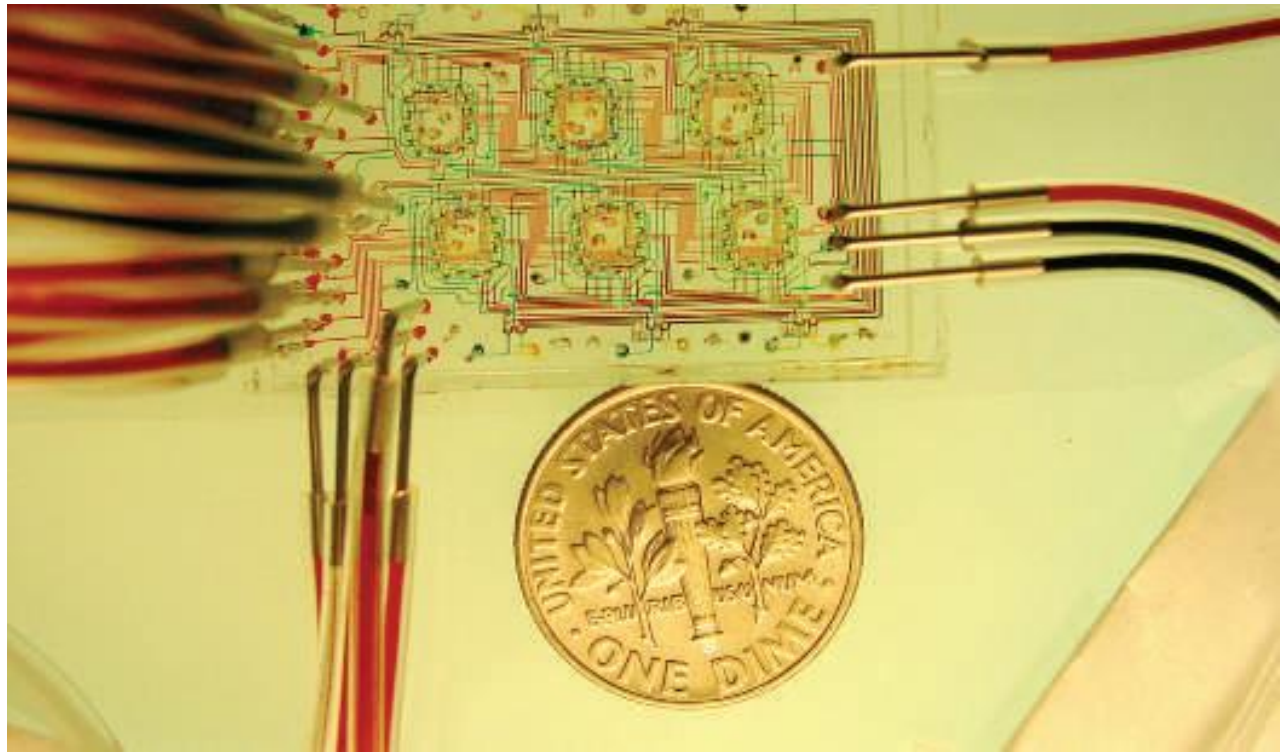
- Micro channels- tens to hundreds of micrometers
- Mesoscale- 10 microns to 1mm
- 10^{-9} to 10^{-18} liters.
- Microfluidics has four parents:

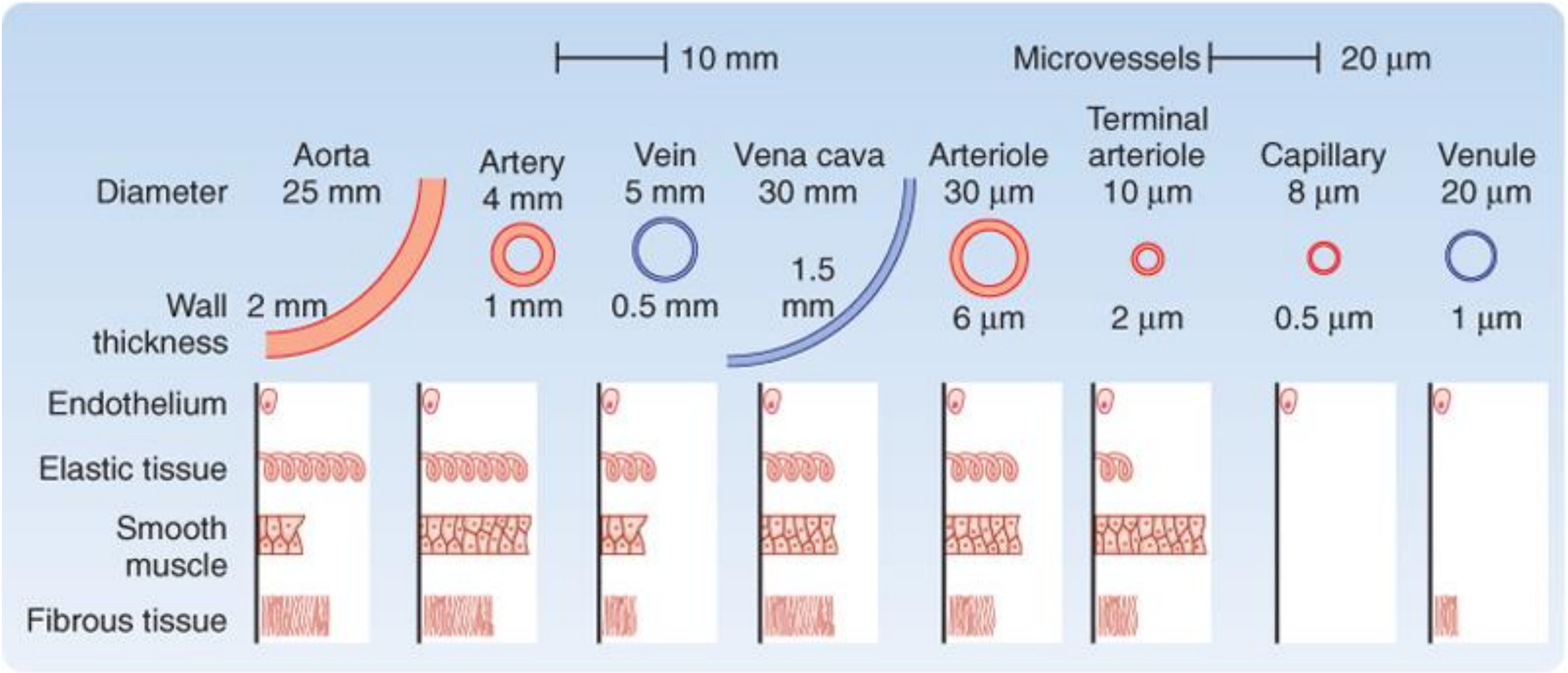
  molecular analysis

  biodefense

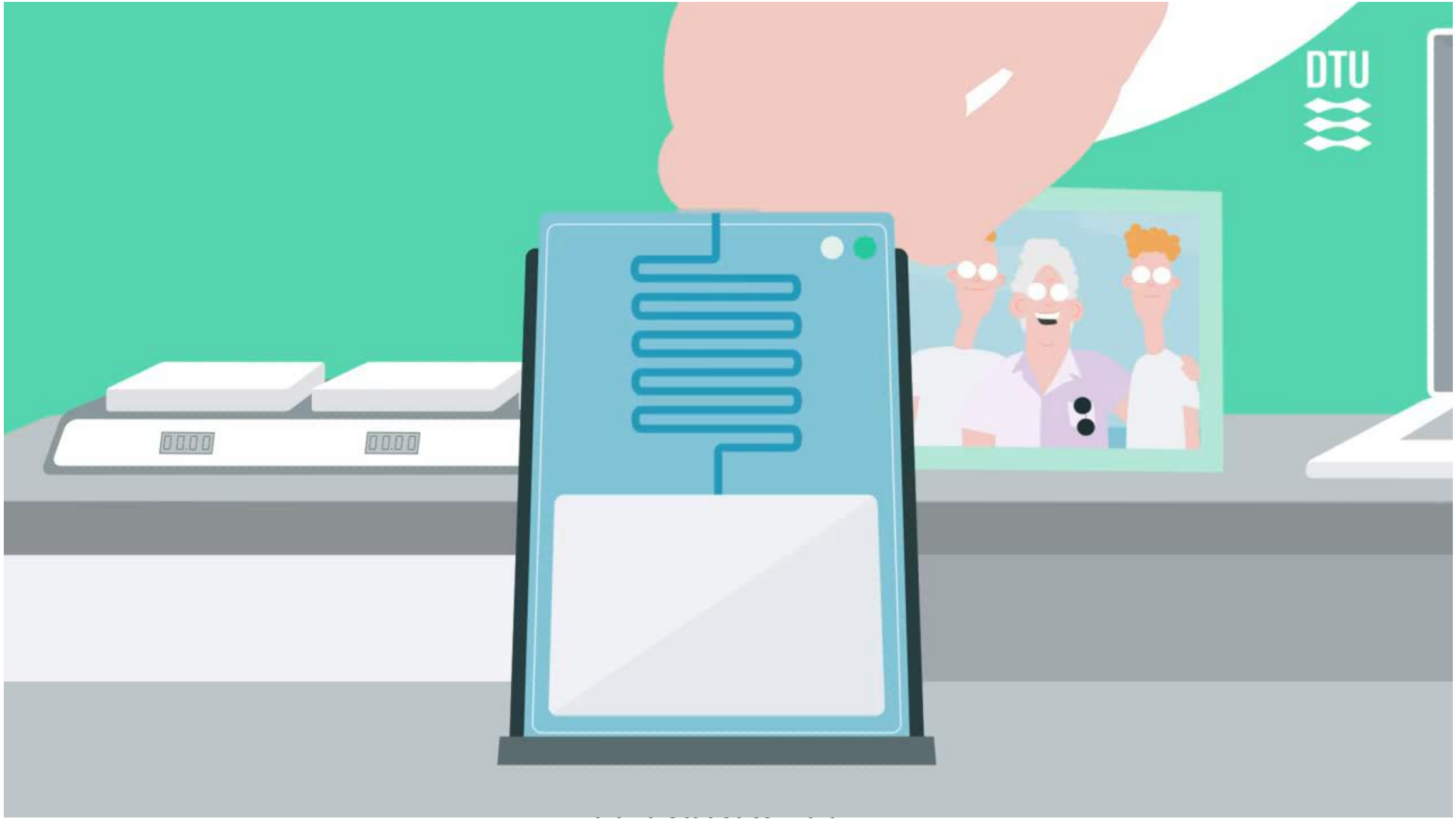
  molecular biology

  microelectronics.

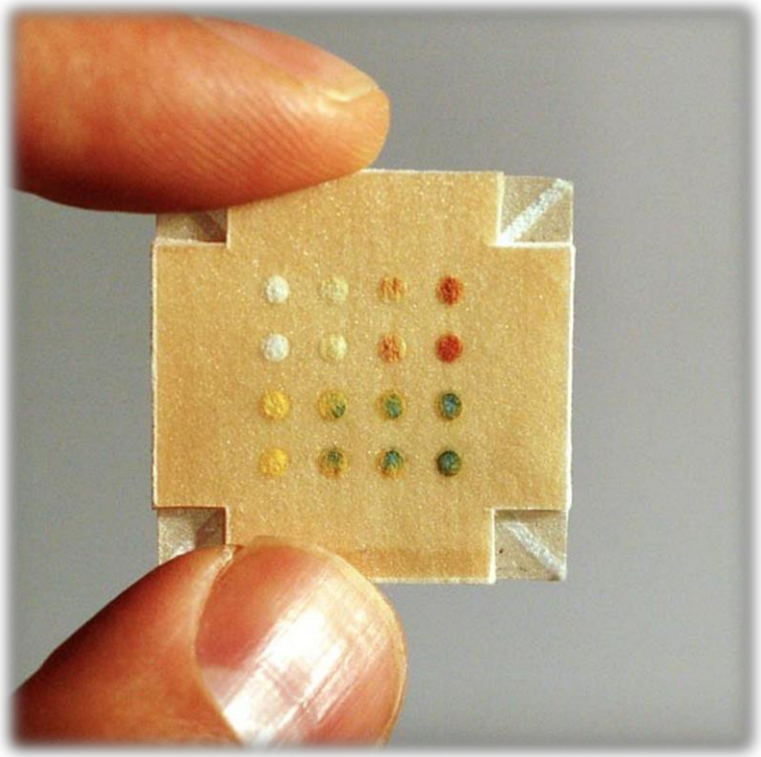




Koeppen & Stanton: Berne and Levy Physiology, 6th Edition.


DTU

Blood Vessels



George Whitesides Research Group, Harvard

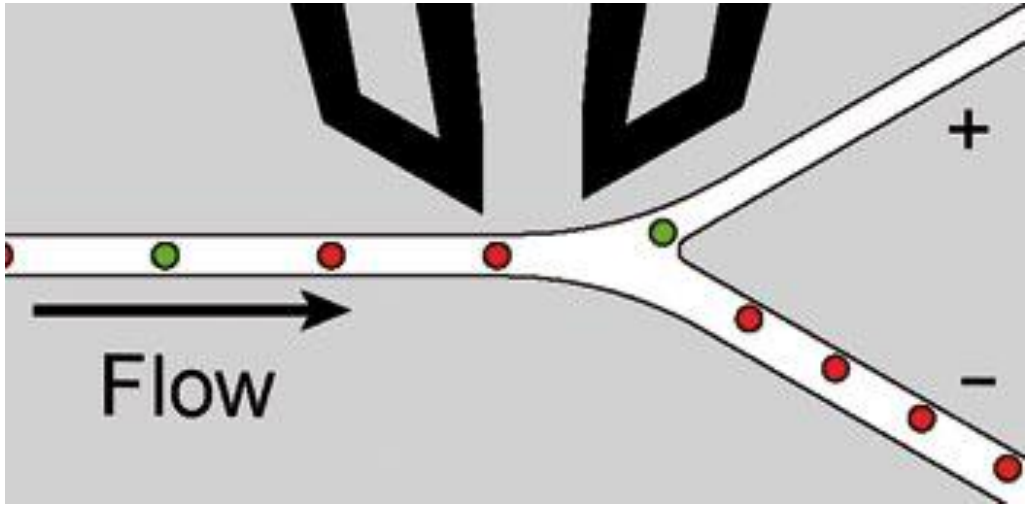
Blood tests rely on colour changes.

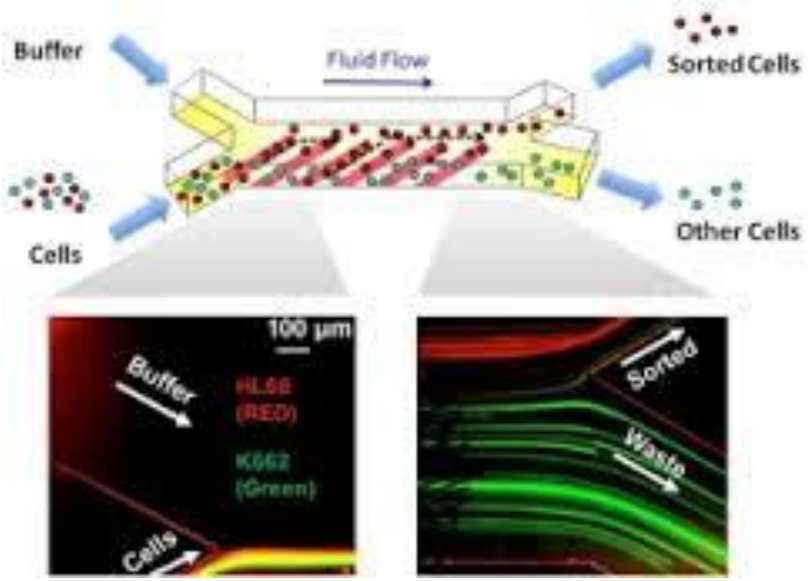
1. blood group
2. pathogenic presence
3. diabetes
4. presence of chemicals

Smaller quantities of chemical reagents and just one drop of blood.

Blood Vessels

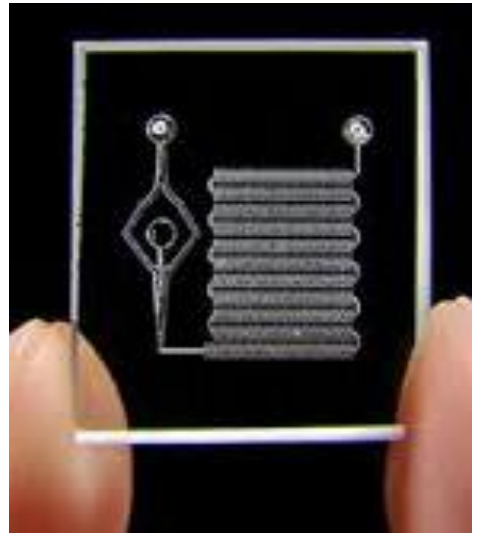
- Cancer cells move about in the bloodstream due to metastasis.





- Diagnosis by CELL SORTING

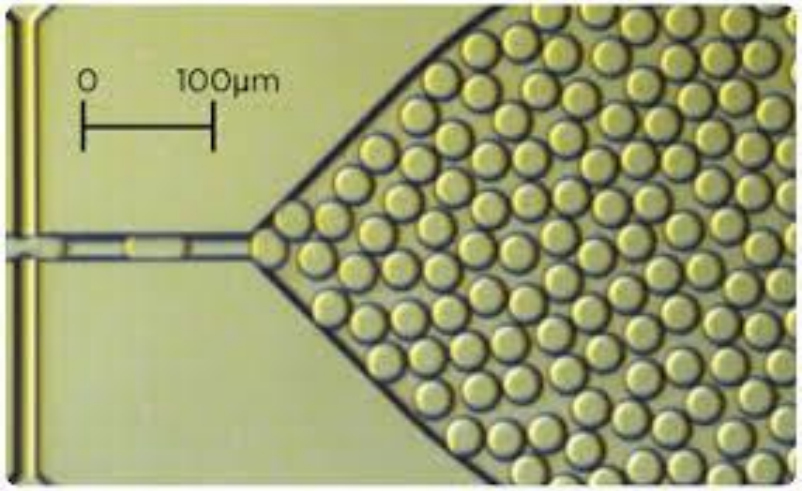
Lab on a Chip

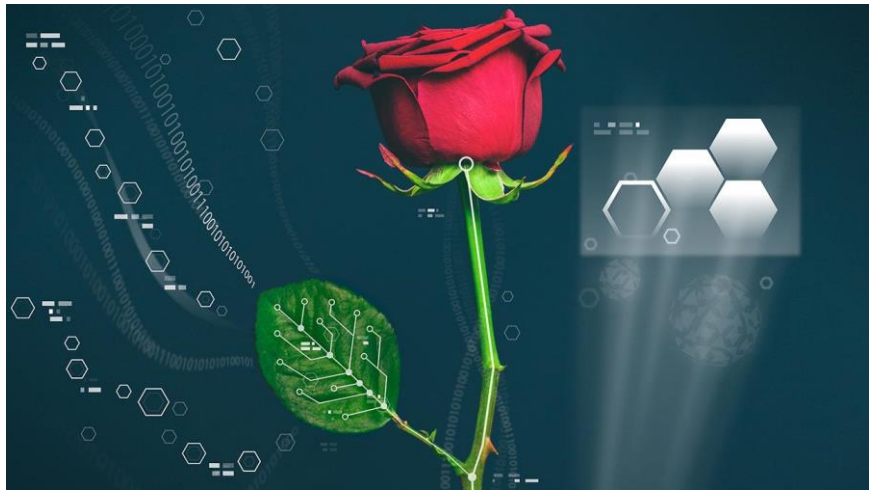


1. Bioreactor
2. Fluid flow and thermal study
3. DNA sequencing
4. Local Assistance Systems
5. Stem cell culture…

launchpad

- Electrical conduction in plants
- Droplet computer
- DNA manipulation
- Less testing on animals

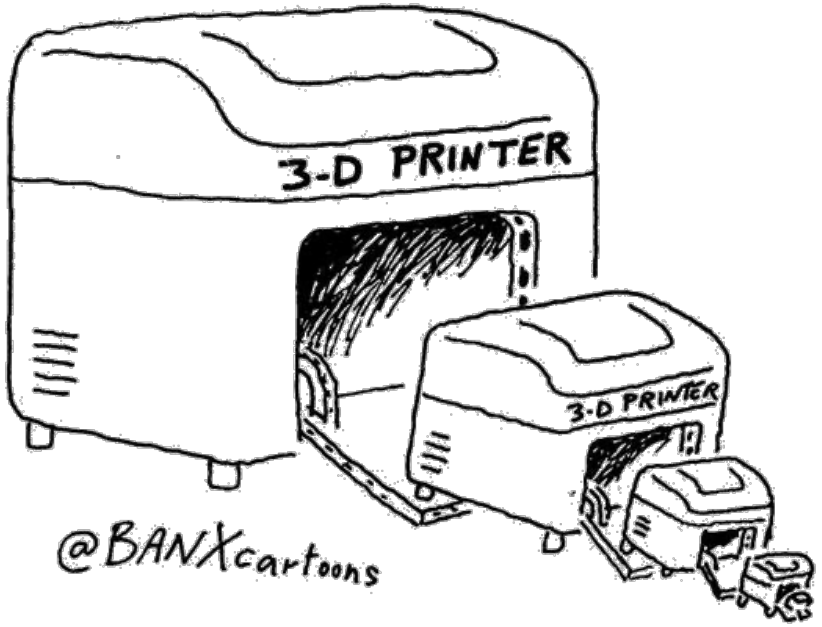




With the microscope we got a closer look, now with the microchip we are able to touch.

Roadblocks

- Micro fabrication techniques
- Material science
- Cost of machinery

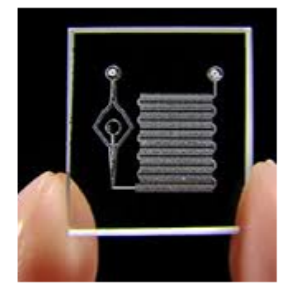


Road ahead

Development of disruptive technologies such as

- 3D printing
- Soft lithography
- Photo lithography….

μfluidics



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