



BIOLOGICAL CHARACTERIZATION PLATFORM

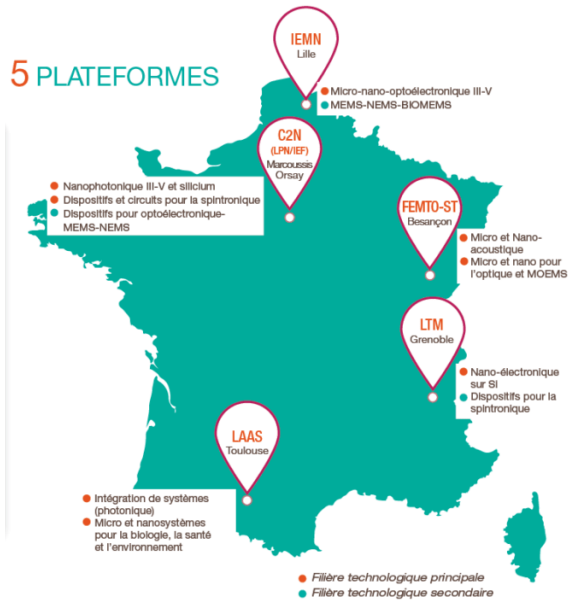


Aurélien Bancaud

Staff: Charline Blatché, Sandrine Assié-Souleille, Louisa Boyer,
Julie Foncy



ALIVE STRATEGIC AXIS



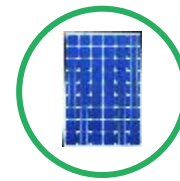
Major extension

New room, biological zone

MultiFab

Multi material 3D printing
Part of MultiFab integrated

2008



2012

2017



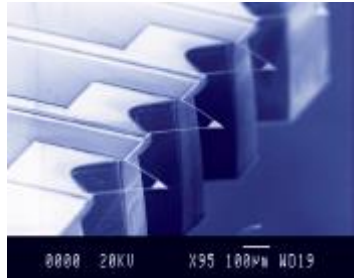
Fourth zone

Biology and chemistry for micro & nano systems

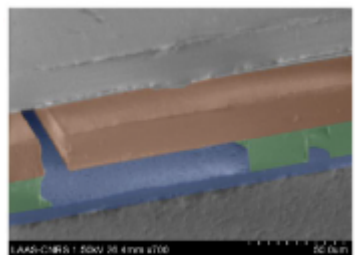


Technologies

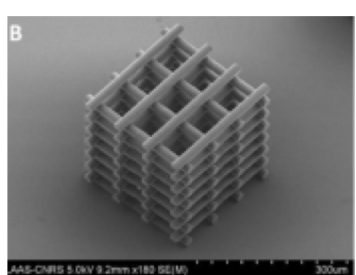
Silicon/glass



Polymers

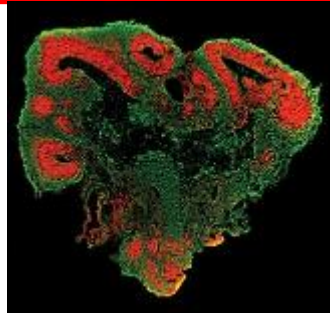


Biomaterials

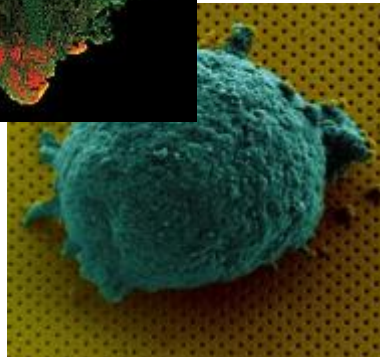


Biological or Environmental Samples

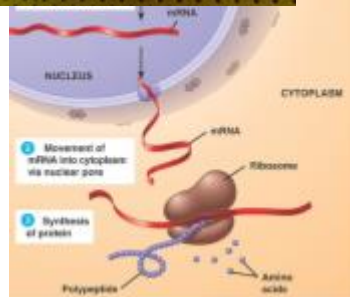
Organoids



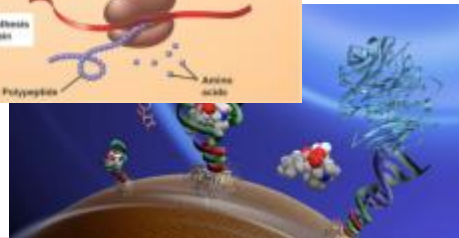
Cells



Intracellular biomolecules



Extracellular analytes



Instrumentation

- Optical microscopy
- Electrical spectroscopy
- Force spectroscopy
- Electrochemistry

Biology

- Microbiology
- Eukaryote cell culture
- Human blood samples

Chemistry

- Nanomaterials
- Light-induced polymerization
- Surface modification

Operational organization

7 rooms for a total surface of 450 m² with ~ 60 users

- 1- Cell culture rooms (class 1 and 2) 45 m²
- 2- Shared space for sample preparation 167 m²
- 3- Optical Microscopy 45 m² & Atomic force microscopy 36 m²
- 4- Electrochemistry facility 30 m²
- 5- Fablab Multifab 37 m²
- 6- « Laboratoires communs » Biosoft & Impyact 20 m²



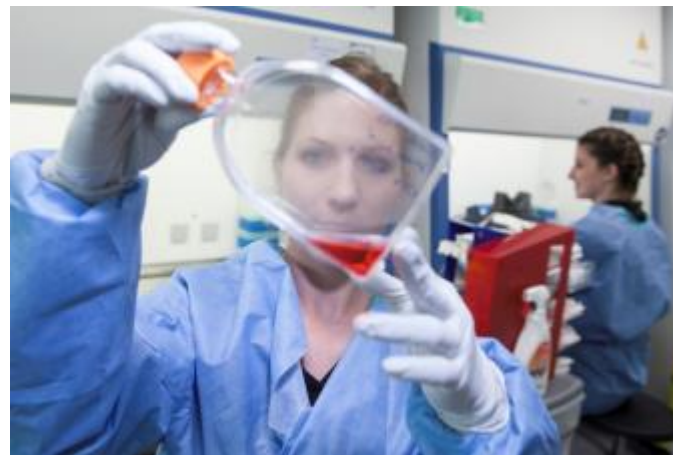
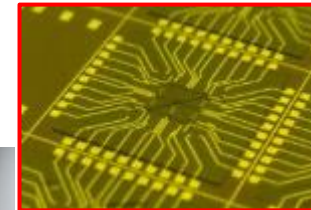
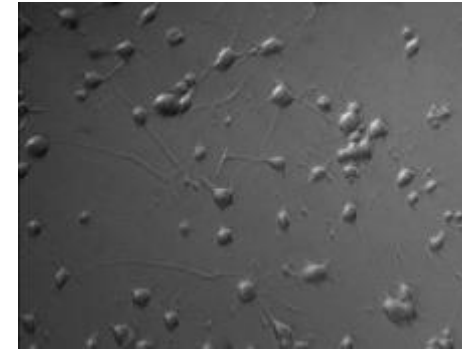
1- Cell culture facility

Facilities:

- *In vitro* culture of (human and animal) cells lines and primary cells (L2 laboratory)
- Human blood samples from “Etablissement Français du Sang”
- Bacteria, yeasts, micro-algae ... (L1 laboratory)

Applications:

- Cell culture in miniaturized microelectronic platforms
- Control of cell growth in miniaturized platforms
- Conditioning and monitoring of microphysiological systems



2- Molecular Biology facility



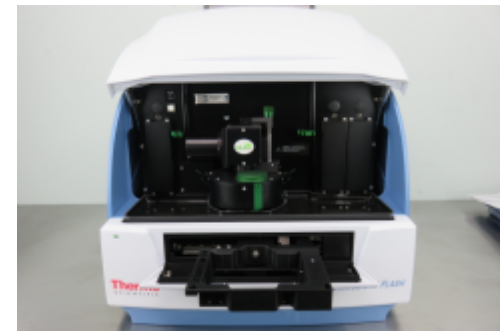
UV-Visible Spectrophotometer

- Absorbance measurements
- Biomolecule titration



Fluorimetry

- UV/Vis/NIR wavelength range
- Microplate format



Applications :

- Sample characterization,
- Blood conditioning,
- immunocytochemistry

3- Chemistry & Nanomaterials

Nanoparticles conditioning



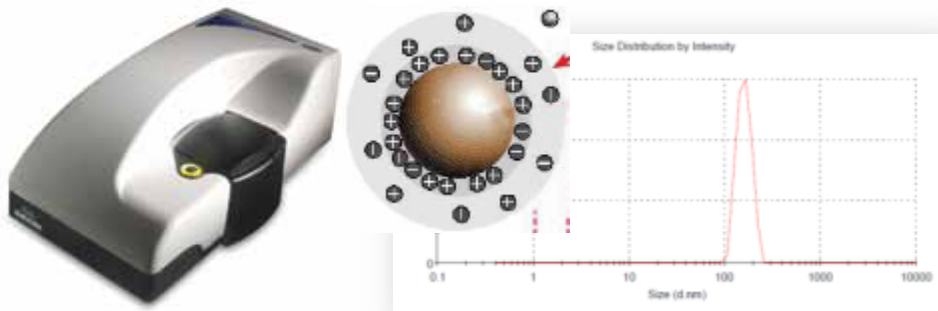
Suspension dispersion



Nanoparticles size and charge characterization

Dynamic Light Scattering - Zetasizer Nano ZS (Marvern):

- Size range 0.6 nm - 6 μm
- Zeta potential measurement



Coulter Counter qNano (IZON Science):

- Size range 40 nm – 15 μm
- Concentration measurement
- Zeta potential measurement



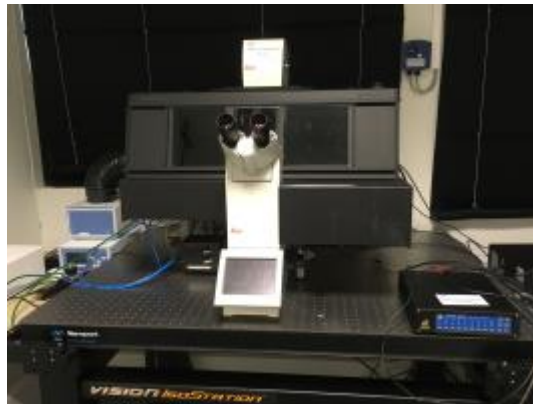
4- Optical/Force microscopy

Facilities:

- Inverted and upright, white light and fluorescence microscopy,
- Chamber with temperature and CO2 controlled environment for live cell imaging
- AFM Nano Wizard3 (JPK) on Zeiss microscope

Applications :

- Microfluidic devices,
- Biomarker analysis,
- Molecule, cell observations,
- Droplets, air microbubble generation in liquid phase.



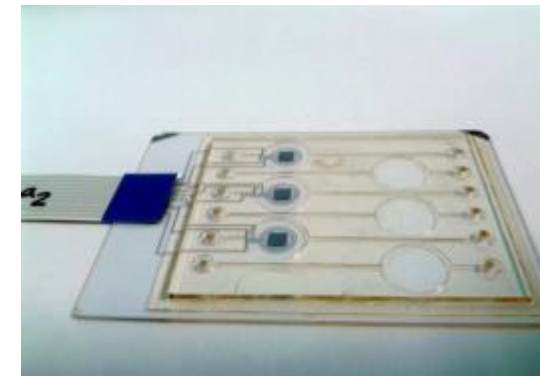
5- Electrochemistry

Facilities to control and measuring the potential or current in liquid

- Metrohm Autolab potentiostat,
- Biologic VMP3 polypotentiostat,
- Ametek Parstat polypotentiostat



- Electrochemical treatment and/or functionalisation
- I-V cyclic voltammetry
- impedance spectroscopy



Applications:

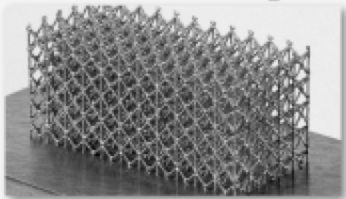
- Detection of anti-oxidant (ascorbic acid, uric acid, glutathion) for skin analysis,
- Detection of algae activity,
- Detection of cell activity.

6- FAbLAB MultiFab

Open platform founded by FEDER and Region Occitanie :

- Development and dissemination of additive manufacturing technologies to academic and industrial partners
- 3D printing and bioprinting technologies, focused on high resolution (<10 μm) and multimaterials
- stereolithography, inkjet printing, laser melting/sintering, proprietary technologies based on high-resolution photopolymerization and microfluidics for bioprinting

Selective Laser Sintering /
Melting



P. Tailhades, V. Baco

MACRO

Inkjet printing



V. Conédéra, F. Mesnilgrete

MICRO

Two photons lithography



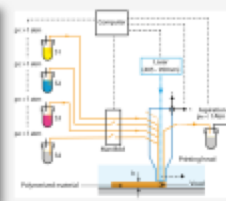
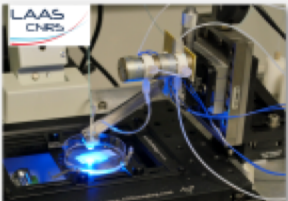
P-F Calmon

NANO

1m 10 cm 1cm 1mm 100μm 10μm 1μm 100nm 10nm 1nm

- Fabrication of microdevices from the millimetric down to the nanometric scale
- Large variety of materials including polymers, composite materials, metals, liquid inks, biomolecules,...

Multi-material bio-printing



S. Assié-Souleille, X. Dollat, L. Malaquin

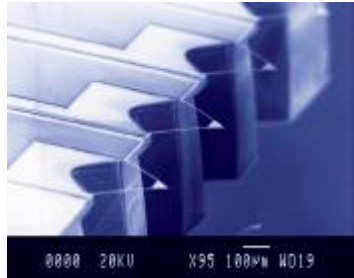
Stereolithography



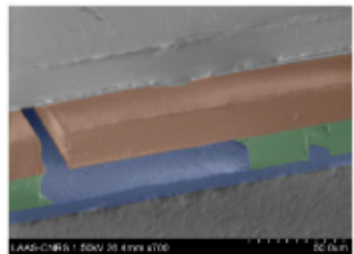
R. Courson, J. Foncy

Technologies

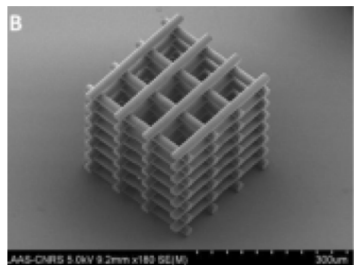
Silicon/glass



Polymers

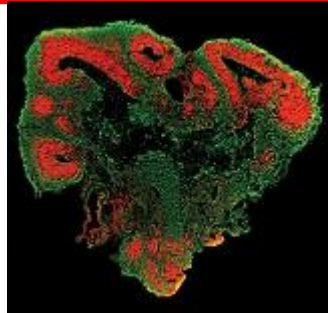


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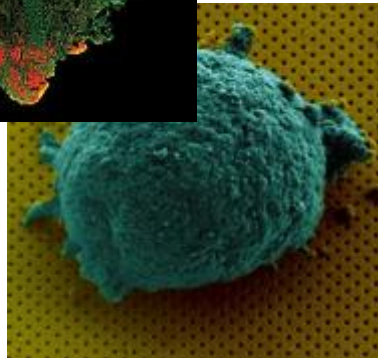


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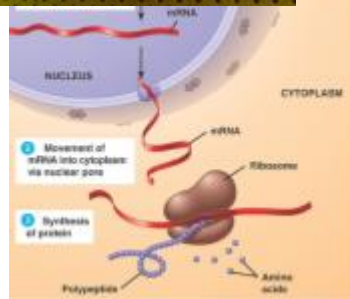
Organoids



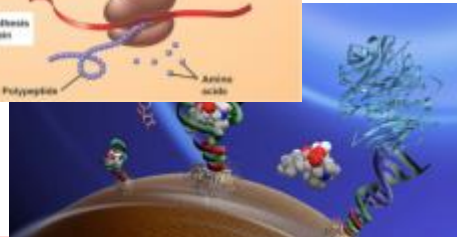
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Biology

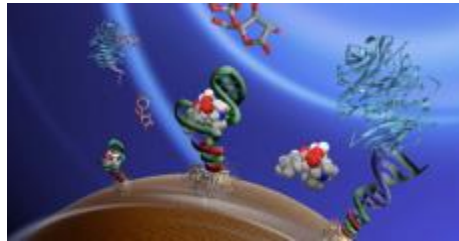
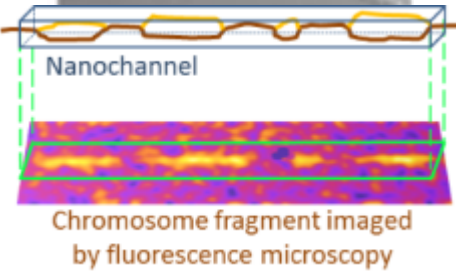
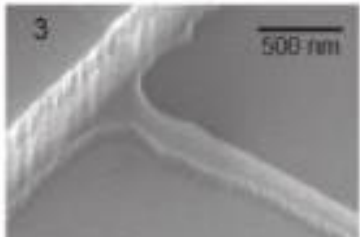
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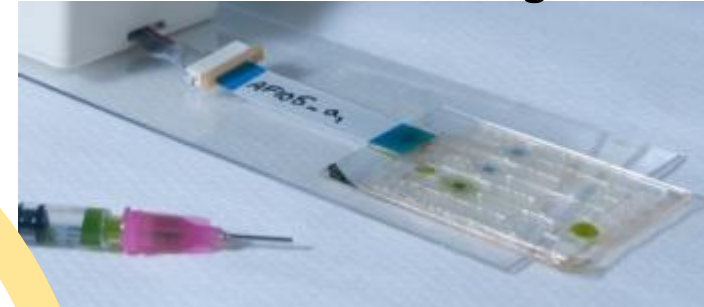
Outcomes – Molecular analysis

Molecular nanomanipulation

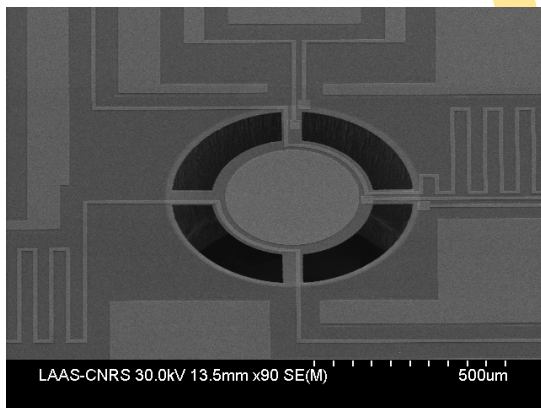


Extracellular analytes

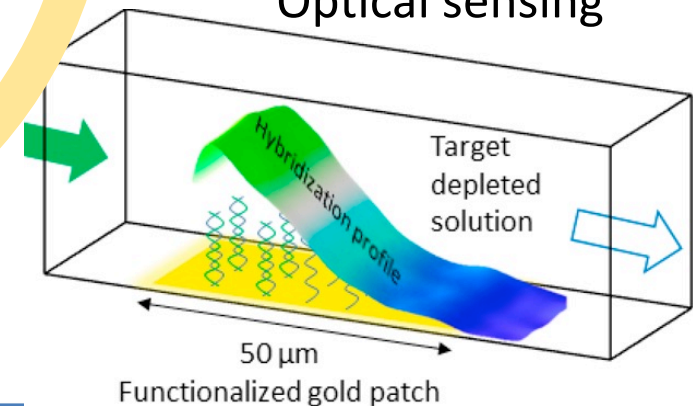
Electrochemical sensing



Mechanical sensing

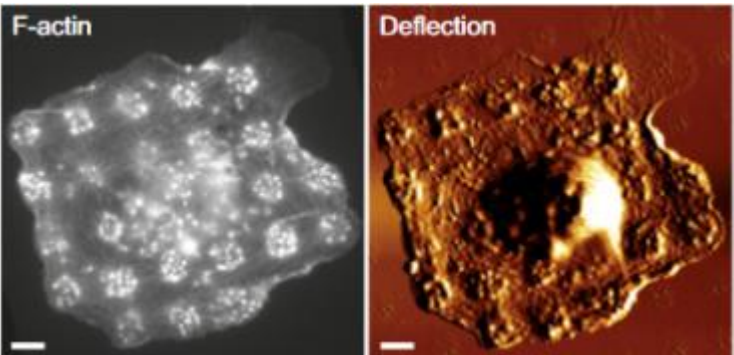


Optical sensing

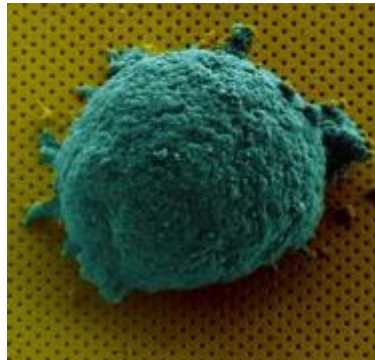
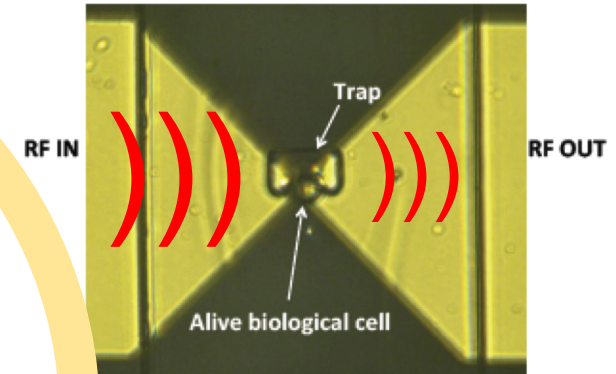


Outcomes – Cellular analysis

Optical & Force Microscopy

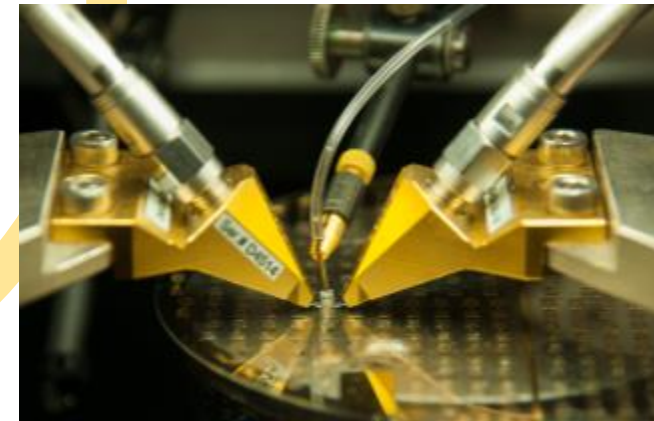
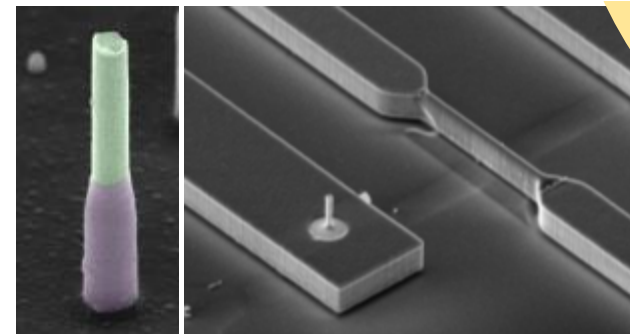


Impedance spectroscopy



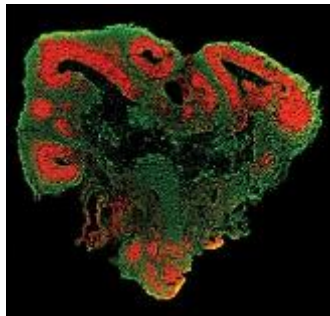
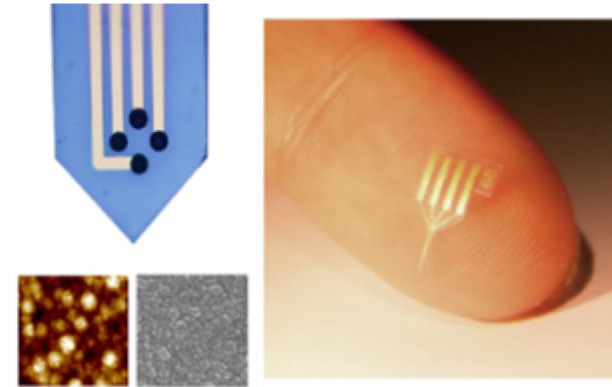
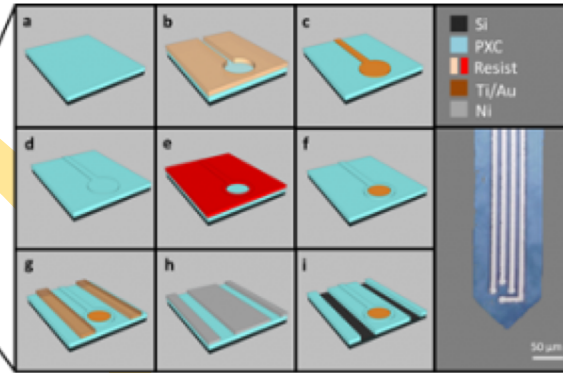
Cells

Electrical activity monitoring



Outcomes – Microphysiological systems

Implanted electrodes



Organoids

Cell culture in complex 3D scaffolds

