

Optical Biosensors

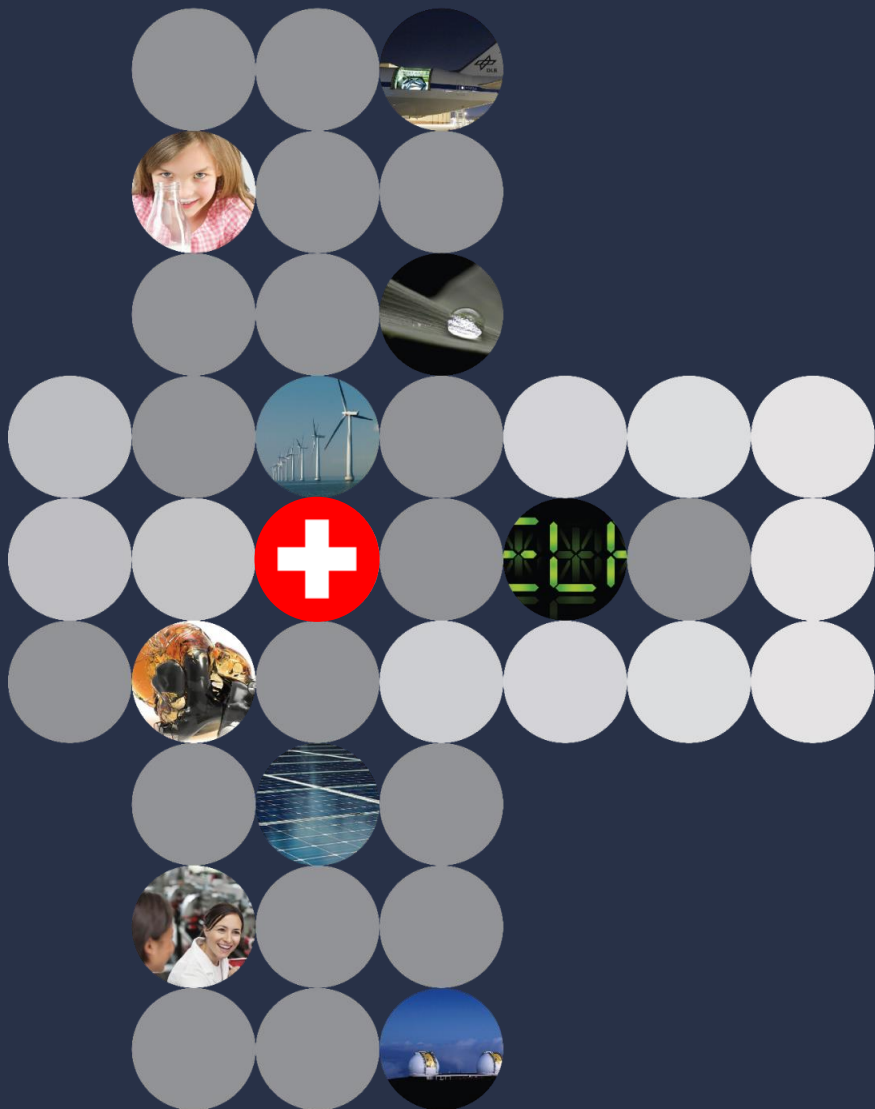
@CSEM



by Stefano Cattaneo

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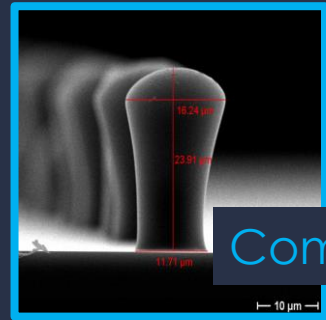
CSEM

Swiss Research and Technology Organization (**RTO**)

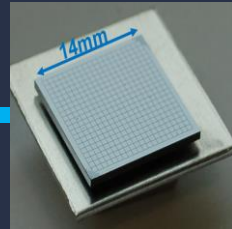
Mission: Technology development & transfer to the industrial sector



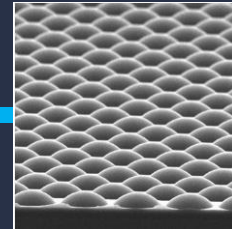
Photonics at CSEM



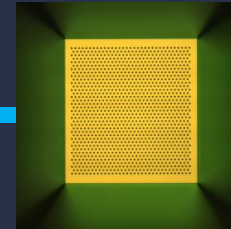
Components



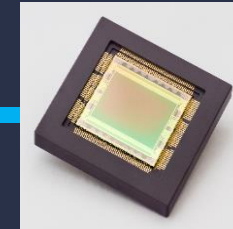
MOEMS



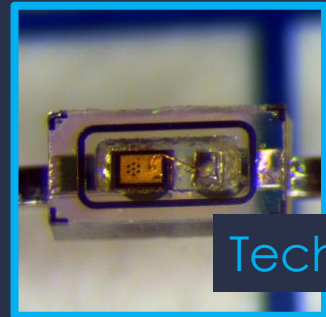
Micro-optics & gratings



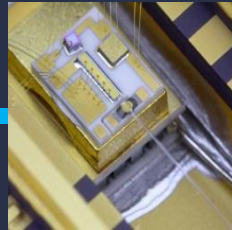
Plasmonics



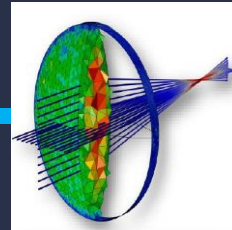
Imaging sensors



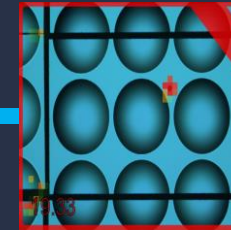
Technologies



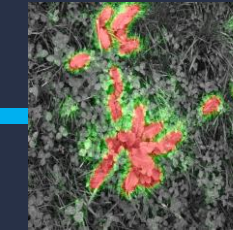
Integration & packaging



Optical design & modelling



Metrology & vision



ML & AI



Systems



Wearables



Cameras



Readout modules



Measurement systems

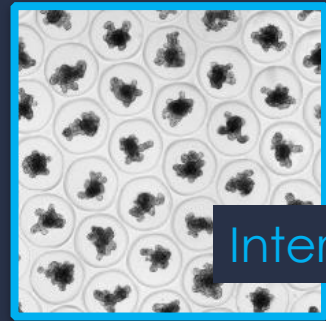
Pilot lines in photonics:



Industrial applications



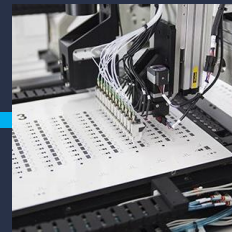
Life Science at CSEM



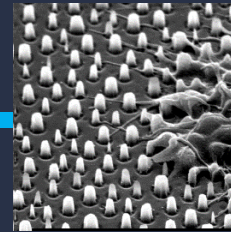
Interfaces



Functional printing



Chemical functionalization



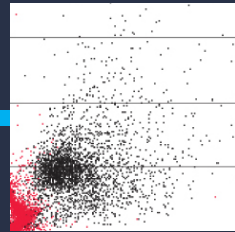
Structuring



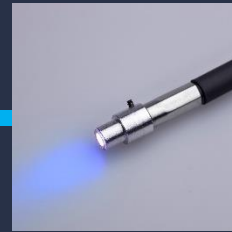
Biocompatibility



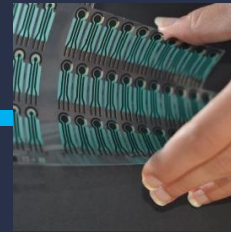
Bio-sensors



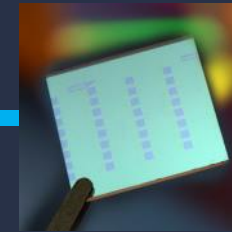
Impedance spectroscopy



Fluorescence



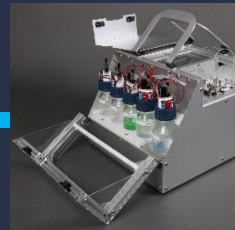
Electrochemical



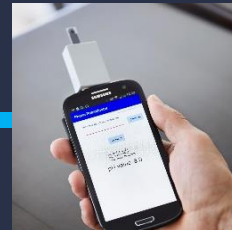
Surface resonance



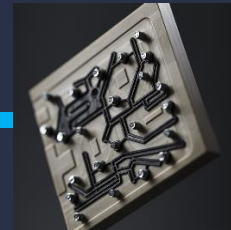
Systems



Sample prep



Readers & Communications



Analyte Enrichment



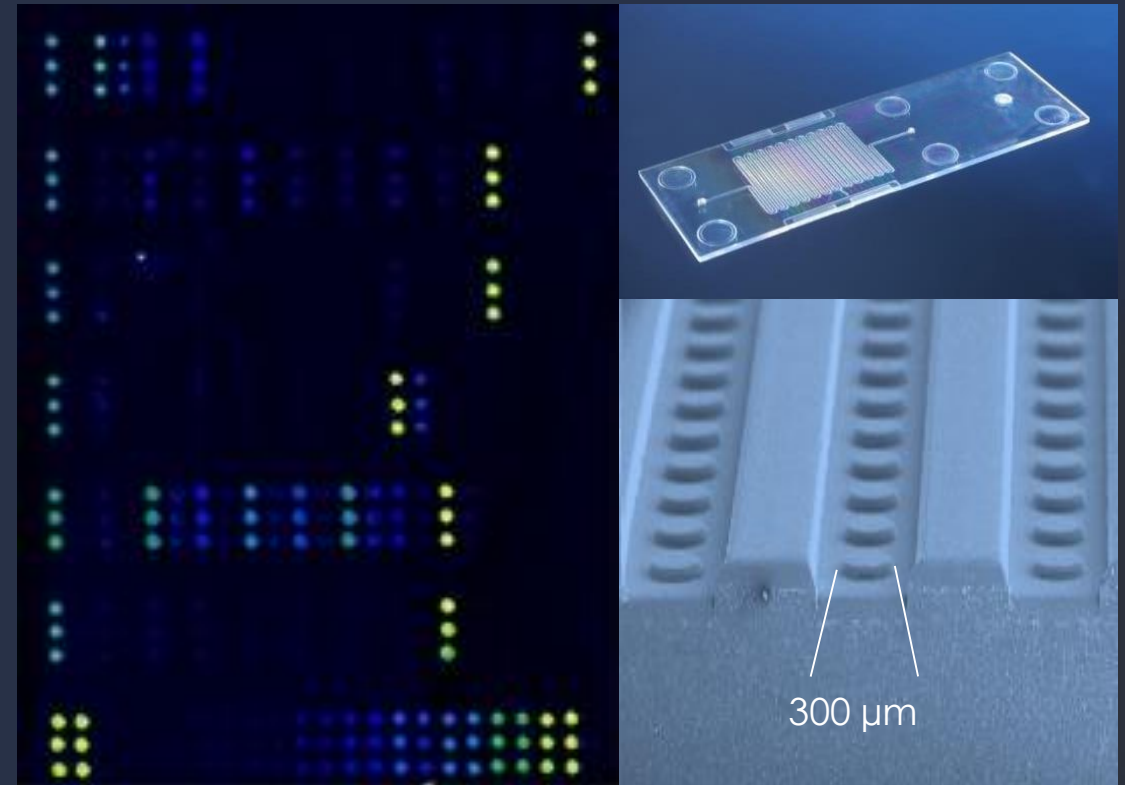
(Big) Data analytics

Industrial applications



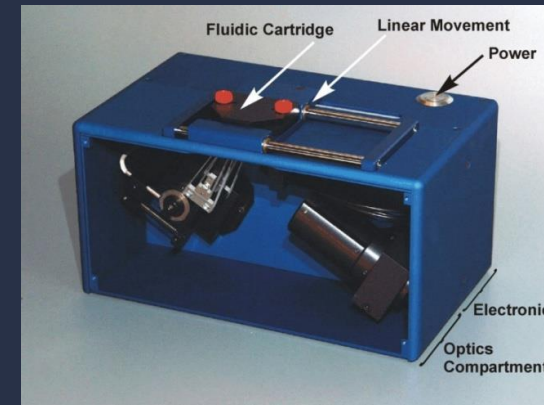
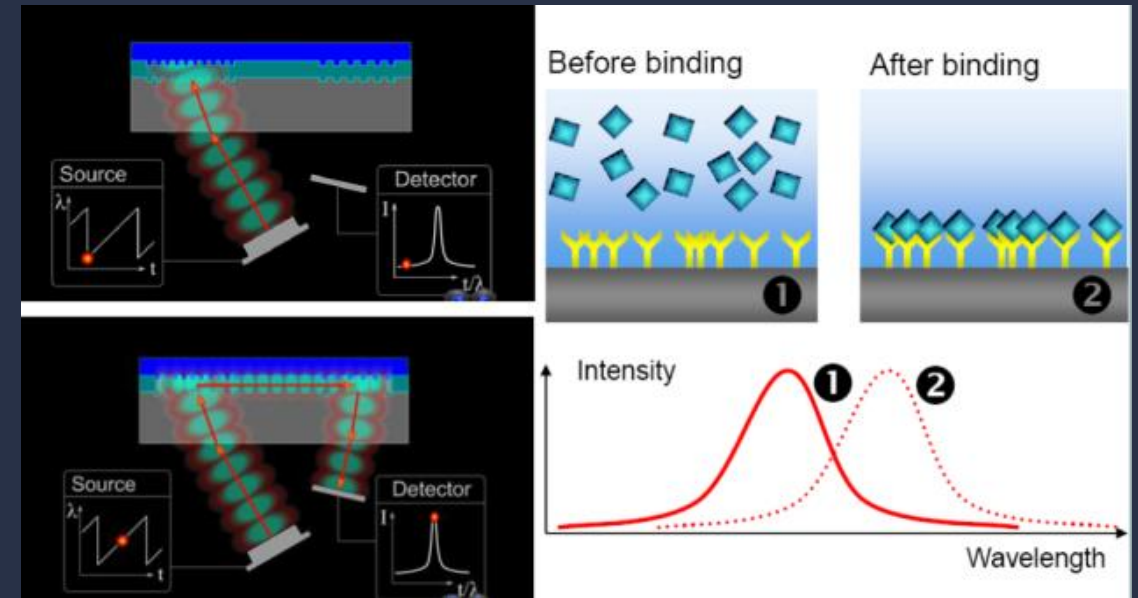
Inca Bioanalytical System

- Multiplexed fluorescence assay
 - Microfluidic chip (IncaSlide)
 - Fluidics and temperature control (IncaTrace)
- Current projects:
 - H2020 Hedimed: Portable system for immuno-signature testing at POC
 - Serological test for COVID-19 with Adamant Innotech



Label-free waveguide biosensor (WIOS)

- Measures molecular binding via refractive index (RI)
- Specific bio-recognition molecules
- Current focus:
 - Assay development for medical diagnostics and food analysis



WIOS Instrument



WIOS Chip

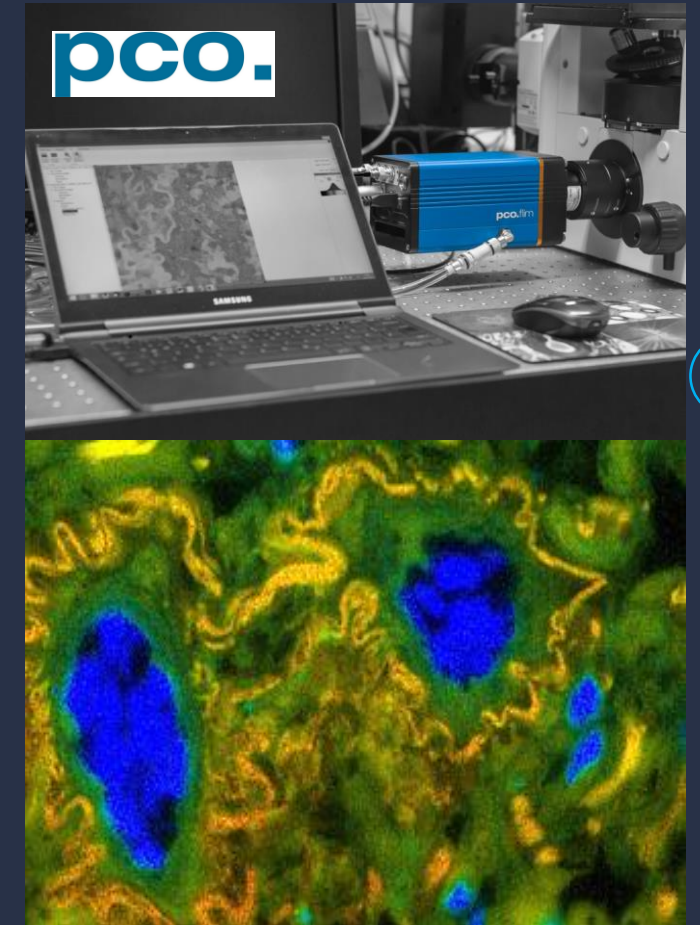
Non-invasive optical oxygen sensing in cell culture

- Porous matrix that encapsulates an indicator dye
- Quenching of fluorescent dye by oxygen
- Objective-like reader



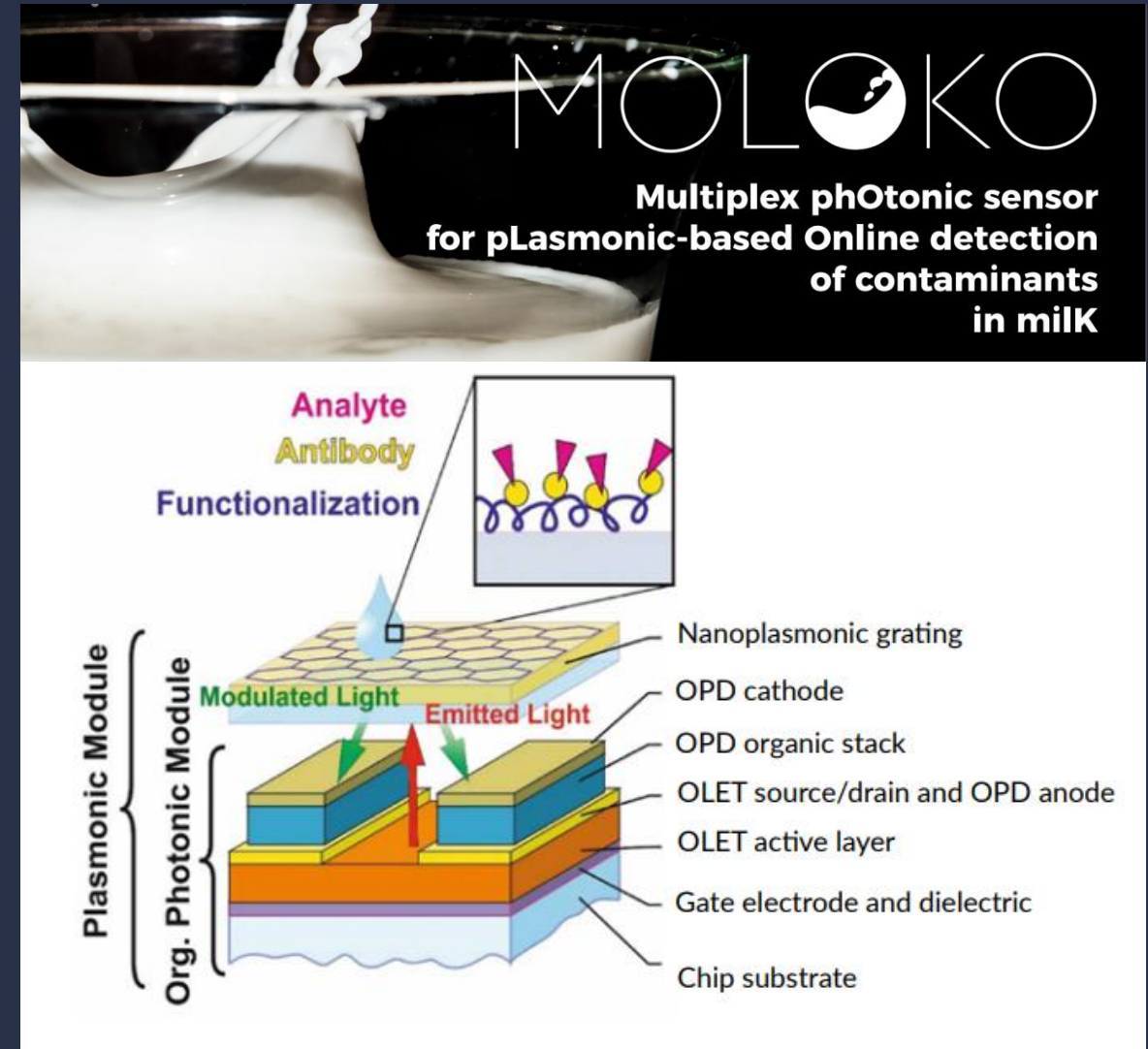
FLIM – Fluorescence Lifetime Imaging

- Stand-alone system for FLIM
- Time-of-flight image sensor
- Yields 2D map of fluorescence lifetime
- High-end camera for scientific applications commercialized by PCO



H2020 Moloko

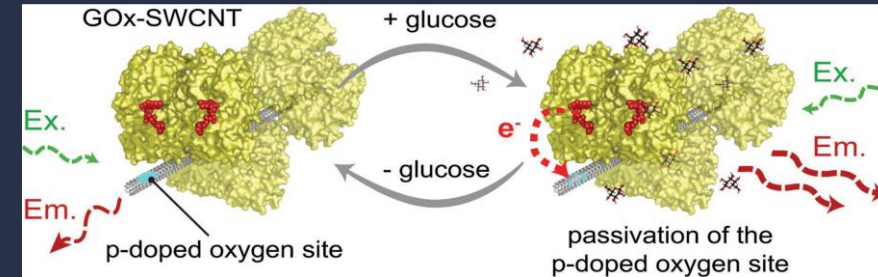
- Colorimetric bioassays in well plates equipped with resonant sub-wavelength gratings
- Goals: enhanced sensitivity, reduced sample volume, faster diagnosis
- Targets: Toxins, antibiotics, quality parameters in milk



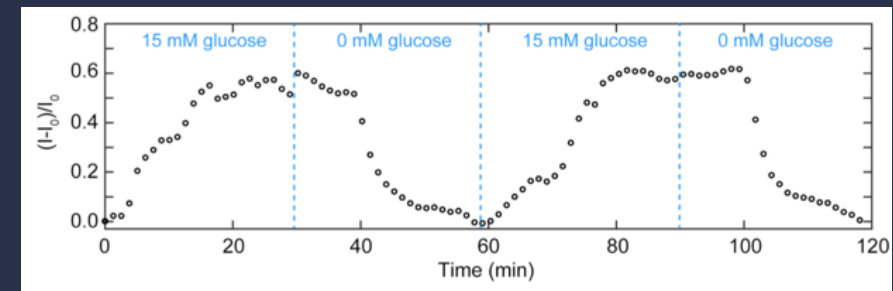
Postdoc for industry: SWCNT-based biosensor

- Glucose monitoring via changes in NIR fluorescence of SWCNTs
- Reversible and stable fluorescent signal
- Current focus:
 - New analytes: lactate, etc.
 - Miniaturization of readout

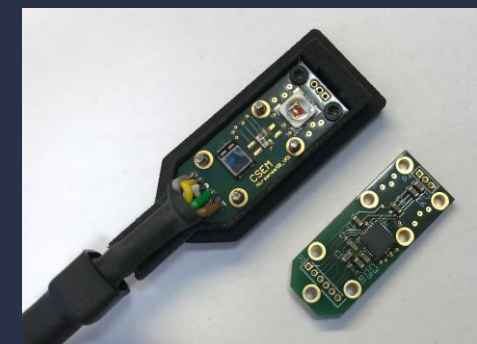
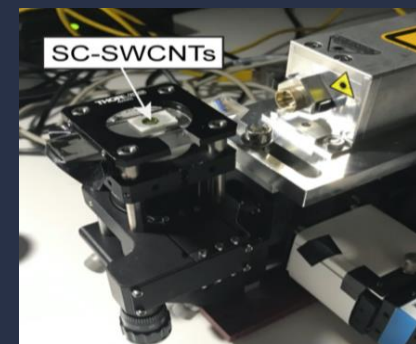
Sensor principle



Glucose measurements



Readout



Collaborating with CSEM

:: What we offer

- Feasibility studies & concepts
- Technology development & prototyping
- Support for industrialization



:: What we are looking for

- Development projects with **industrial partners** for technology transfer
- Research projects with **academic partners** with complementary technologies (e.g. sample collection & pre-treatment)

Visit us on: www.csem.ch

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