

From early detection to *in vitro* diagnosis

Sample preparation

- Optimise sampling protocols for biological fluids and volatile substances

Development of biosensors

- Designing and generating molecular probes to detect exogenous agents.
- Customised functionalisation of materials, micro- or nanostructured objects and 2D and 3D surfaces.
- Engineering membrane receptors as biosensors: design, expression, integration.
- Integrating biosensors into micro and nanoelectronic devices for real-time monitoring.

Detection and testing

- Discovering biomarkers of disease for precision medicine.
- Developing in situ and multiplex approaches for rapid, early and low-cost diagnosis.
- Develop direct and specific detection modes on complex biological matrices.

Surveillance and therapeutic follow-up

- Implement and evaluate biological protocols in *in-vitro* diagnostic demonstrators.
- Validating biomarkers of disease in small precision cohorts.
- Develop non-invasive analytical methodologies.

Expertise

Preparation of complex matrices
blood, urine, pulmonary exhalations, menstrual fluids...

Custom probe biomolecules
DNA, aptamers, antibodies, nanobodies, peptides, metalloptides, sugars ...

Photocleavable metal probes/ chelators

Functionalization of surfaces
Gold, ITO, glass, silicon, magnetite...

Electronic nose / Biosensors

Technologies

Electrophysiology 96 wells

Surface Plasmon Resonance

Nano-resonators

opto-mechanical resonators

Lensless imaging

Optical trapping / fibre optics / photonics on a chip

Proteomics *

Mössbauer spectroscopy *

Automated biomarker extraction and purification

** Platform-Service*

In figures

6 PhD students incl. CIFRE per year
 36 researchers
 39 publications per year
 13 patents
 6 EU projects
 20 industrial partnership

Networks & ecosystem



ProFI
 PROTEOMICS



GDR Biomim - 2088



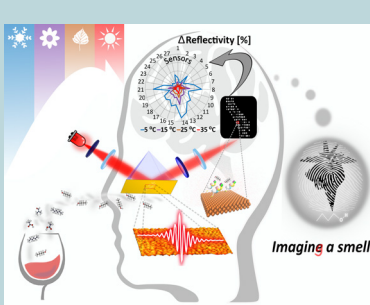
OR-nano
 GROUPEMENT DE RECHERCHE



GDR B2I
 GDR Bio-ingénierie
 des interfaces



GDR 2088 "BIOMIM"
 BIOMIMÉTISME et BIINSPIRATION



An electronic nose based on peptide nanostructures

Detection and analysis of volatile organic compounds (VOCs)

> Future tools for early diagnosis

ACS Nano 2022, 16, 3, 4444–4457



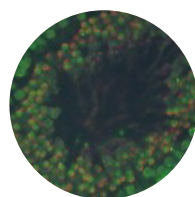
Rapid, multiplexed and quantitative detection

VOCs, metals, pollutants, viruses, exosomes, bacteria, pathogens and threats.
Detection in gas or liquid phase



Multi-omics biomarkers

VOCs, circulating proteins, fibrils, nucleosomes, histones, mechanobiology of cells and tissues, cell invasion...



Optical and photonic biosensors

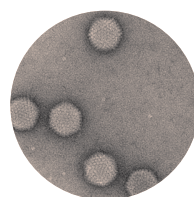
Development of tools for the field of antibiotic resistance, such as phagotherapy



From biomarkers to biosensors

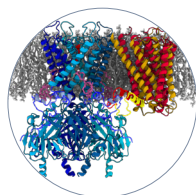
Mass measurement of nanoscale particles

Viruses, viral vectors, exosomes, nanoparticles, aerosols



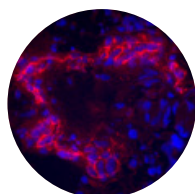
Customised membrane receptors

In vitro functional characterisation of insect repellents, bioinspired biosensors and olfactory receptors



Biomarkers of disease

Hepato-physiopathologies, lung, inflammation/diabetes, Huntington's, cancers, Alzheimer's...



Rapid and automated blood sample preparation

From plasma extraction to on-chip peptide purification.

> Simplification of proteomic analysis and biomarker discovery

Analytical Chemistry 2021, 93(2):683–690



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