SOLEIL SYNCHROTRON

FOR **BIOLOGISTS**

DISCO

beamline

IMAGING

ORGANISMS

TISSUES

CELLS

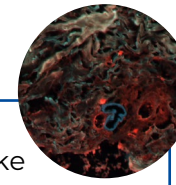
ORGANELLES

COMPLEXES

PROTEINS

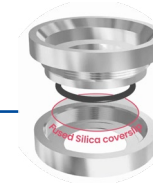
ATOMS

SAMPLES



TYPES

- Cells (living, hydrated or fixed) like bacteria, yeast, or immortalized cell lines.
- Histological slices from animal or vegetal samples. **Thickness** between **1 and 50 µm**.
- Thin cross-sections of composite materials like paintings, or rocks.



ENVIRONMENT

- UV fluorescence requires **fused Silica cover slips** (25 mm in diameter).
- **UV compatible embedding** for fixed samples are required!
- **Temperature controlled** stage, with cell ultivation system (POCmini-2 from PECON).
- **Microfluidic** chip **ready** with a flow pressure controler (OB1-MK3+, with 4 independent channels) and a microfluidic laboratory at SOLEIL.

LABORATORY INSTRUMENTS

- **Multi-photon microscope** (2-photons excitation from 710 nm to 920 nm, equivalent to fluorescence excitation from 355 nm to 460 nm).
- **Spectrofluorometer** to measure excitation and absorption spectra from samples in solution.

TECHNIQUE

DISCO is a **VUV to visible beamline** dedicated to biochemistry, chemistry and cell biology. The **spectral region** is optimized between **120 and 700 nm** with conservation of the natural polarization of the light. The **Imaging end-station** couple the **low flux (µW) deep UV** light with different microscopes to probe the **fluorescence** of living and fixed samples.

POLYPHEME: Hyperspectral microscope

Point scanning microscope coupled with a spectrometer 0.5 nm spectral resolution and 1 µm step size.

Hyperspectral Images.

TARTAMOS: Absorption Imaging

Coupled UV fluorescence and transmittance measurements (nucleic acid and protein mapping).

TELEMOS: Widefield multispectral microscope

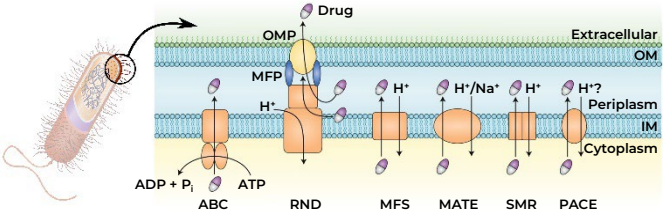
Inverted microscope with UV objectives 10x, 40x, 100x, with 1 µm, 250 nm, and 100 nm pixel sizes respectivly.

Time lapse acquisition of dynamic Processes.

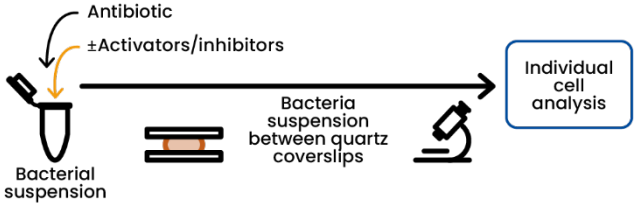
Multi-Dimensional acquisitions: time, z-stack, XY-tiling, emission filters, excitation scanning.

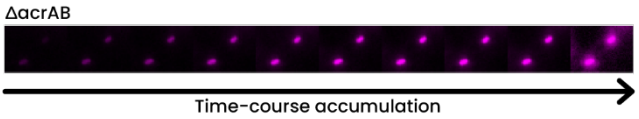
HIGHLIGHTS

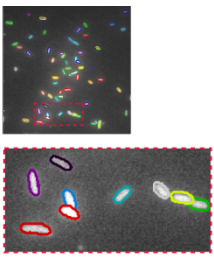
Bacteria uptake and efflux of unlabeled or labeled antibiotics can be studied using DISCO imaging end-station.

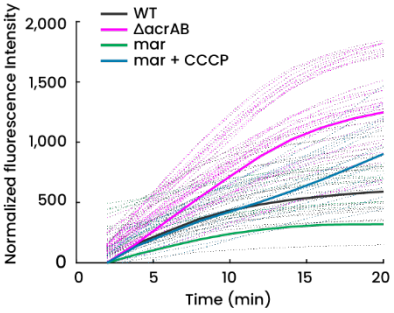


This method allows the **quantification** of **antibiotic accumulation** in **individual bacteria** within a large population. The comparison between different bacteria strain and antibiotics provides key information to understand and find molecules to overcome the drug resistance of bacteria (the overuse of antibiotics being one of the reasons for the increase of multi-drug bacteria resistance).









M. Masi et al., **Nat. Microbiol.**, (2017)
J. Vergalli et al., **Nat. Protocols.**, (2018)

REFERENCES

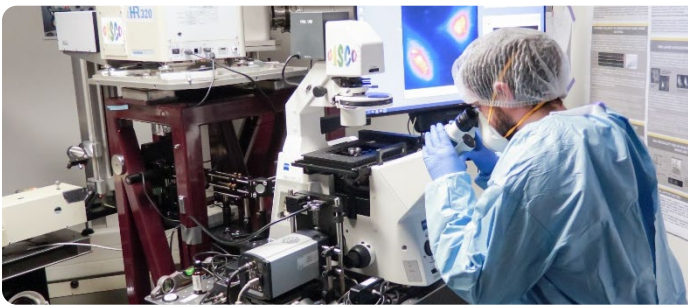
- Giuliani et al., **DISCO: a low-energy multipurpose beamline at synchrotron SOLEIL.** Journal Of Synchrotron Radiation, (2008)
- F. Jamme et al., **Deep UV autofluorescence microscopy for cell biology and tissue histology.** Biol. Cell, (2013)

More information on DISCO publications web page

COMPLEMENTARY BEAMLINES

ANATOMIX, to obtain two- and three-dimensional radiographic images of bulk volume samples of macroscopic size. **NANOSCOPIUM**, for quantitative imaging (morphology, elemental composition and chemical speciation) from nano to microscopic size.

SMIS, to obtain images using infrared spectromicroscopy. **LUCIA** for X-ray microprobe with capabilities for chemical speciation by x-ray absorption spectroscopy (μ-XAS) and for elemental mapping by X-ray micro-fluorescence (μ-XRF).



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Health & Well-Being at SOLEIL

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SOLEIL's Health and Well-being Scientific Section is composed of 30 scientific experts from different fields. Through collaborative and science-driven approaches, the Section offers the community a coherent portfolio of state-of-the-art techniques to serve scientific and societal health-related challenges.

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