



Advanced Microscopy

What we do

Much of our work is done in the form of projects that are performed in close collaboration with research groups. These generally involve developing or modifying microscopy setups or acquisition protocols to answer specific biological/biomedical question. The following are examples thereof:

Investigation of DNA damage/repair dynamics using time resolved fluorescence microscopy

Modification of a time-resolved fluorescence confocal microscope to study DNA damage/repair dynamics to include a custom software controllable 355nm laser to induce DNA damage at specific locations/times while studying recruitment dynamics and co-dynamics of different molecules using Fluorescence Correlation (Cross) Spectroscopy and Fluorescence Lifetime Imaging.

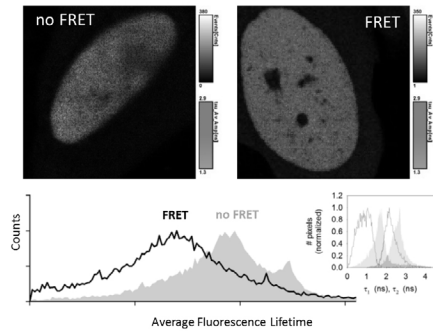
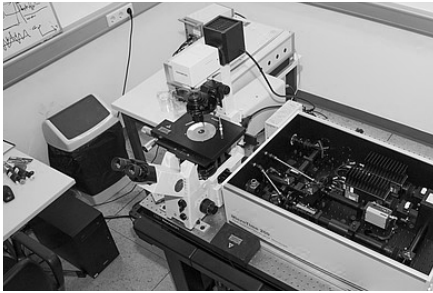
Mapping of mechanical properties of living cells

In collaboration with plant biologists at GMI we visualized in 3D the mechanical properties of the extracellular matrix of live plant cells and their dependence on exposure to light. Using a novel custom-built Brillouin + Fluorescence Microspectroscopy setup we mapped changes in the mechanical properties with near diffraction limited resolution over time subject to various perturbations. Current work is based on correlating other molecular (chemical) signatures with underlying mechanical properties.

“Next generation” imaging of cells

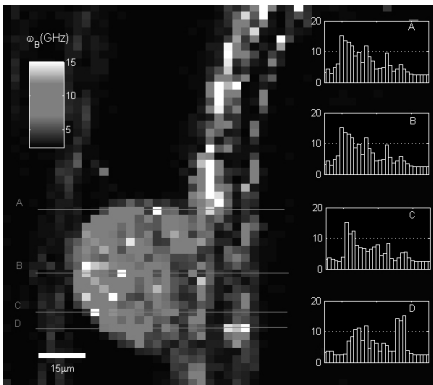
In collaboration with groups at the IMBA, IMP & MFPL, we have developed a so-called Lattice Light Sheet Microscope, capable of fast 3d time-lapse fluorescence imaging of cells with very high resolution and minimal phototoxicity. The instrument is currently generating the first significant results.

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Fluorescence Lifetime Imaging Microscope (FLIM)

a map of the fluorescence lifetime distribution in two cells, one in which there is no FRET (left) and one where there is FRET (right). Also plotted is the average fluorescence lifetime distribution in the two cells showing a clear difference in the average lifetime.



Brillouin Light Scattering Microscopy (BLSM):

A map of the Brillouin Frequency Shift (proportional to the square root of the elastic modulus) of the nucleus and cell wall of an onion cell.

Services and Methodologies Provided

- **Access to all our instruments and technologies** (subject to availability, full list of techniques can be found on our website: www.vbcf.ac.at/advmicro)
- **Project specific know how related to available technologies/** techniques and assistance in performing experiments, as well as analyzing and interpreting data.

In some cases, a basic training on the instrument for visiting staff member followed by independent use may be sufficient, while in other cases a much closer collaboration with us may be necessary.

Equipment

- **Time-Resolved Fluorescence Confocal Microscope**
- **Confocal Microspectroscopy Setup**
- **Light Sheet Fluorescence Microscope (L-SPIM):**
A custom-built fast light sheet microscopy optimized for studying plants
- **Brillouin Light Scattering Microscopy (BLSM):**
Allows one to non-invasively and all optically map the mechanical properties of samples with near diffraction limited resolution.
- **Fluorescence Lifetime Imaging Microscope (FLIM)**

Other equipment we offer:

- 3d Structured Illumination Microscope (superresolution fluorescence microscope) [GE/Applied Precision OMX Blaze]
- LaVision BioTec Ultramicroscope II (light sheet microscope for large cleared samples)
- Lattice Light Sheet Microscope (light sheet microscope for fast high-resolution studies of smaller samples)
- Wetlab facilities, including incubator and fume hood

Contact and Location

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