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Evanescent Waveguide Microscopies for Bio-Application

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Two new evanescent field microscopy technologies based on glass slab waveguides with permanent coupling gratings are introduced: waveguide evanescent field fluorescence (WEFF) microscopy and waveguide evanescent field scattering (WEFS) microscopy.
The technologies are briefly described and the experimental setup based on a conventional inverted microscope is introduced and compared to existing technologies like TIR and TIRF. The advantages over the existing technologies are clearly addressed.
For each technology one application in cell biology is shown.
With multimode WEFF microscopy, taking at least two images with two different waveguide modes, it is possible to determine the fluorescence dye location above the waveguide surface. Therefore 2D dye distance maps or 3D contour plots can be calculated for the samples. As an example, the bending of the plasma membranes of cells between focal adhesions and focal contacts to the waveguide surface are investigated.
WEFS microscopy which works as a label-free microscopy is used to analyse bacterial biofilm formation: from a parent cell to micro-colonies. In addition experiments on bacterial UV sterilization and its consequences on biofilm formation are shown.

Author: Prof. MITTLER, Silvia (University of Western Ontario)

Presenter: Prof. MITTLER, Silvia (University of Western Ontario)

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