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2 Classical optics and microscopy

2.2 Methodology

- 2.2.1 Conventional wide-field optical microscopy
- 2.2.2 Interference contrast microscopy
- 2.2.3 Phase contrast microscopy
- 2.2.4 Fluorescence microscopy
- 2.2.5 Confocal light scanning microscopy (CLSM)
- 2.2.6 Total internal reflection microscopy (TIRF)

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Widefield Microscopy: Contrast

Self-luminescent objects

Object plane

Objective

Tube lens

Image plane

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Widefield Microscopy: Contrast

Self-luminescent objects

Object plane

Plane below focus

Objective

Tube lens

Image plane

Plane below image

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Confocal Microscopy - Principles

Excitation beam

Object plane

Plane below focus

Objective

Tube lens

Aperture in image plane ("Pinhole")

Detector

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KIT Confocal Microscopy - Principles

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KIT TIRF-Microscopy

Total Internal Reflection Fluorescence

Olympus

KIT TIRF-Microscopy

Figure 7

Figure 2

Olympus, Nikon

KIT TIRF: Example

Fluorescing beads in watery solution (Brownian motion)

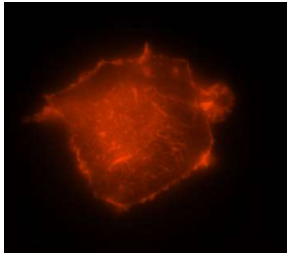
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Zeiss

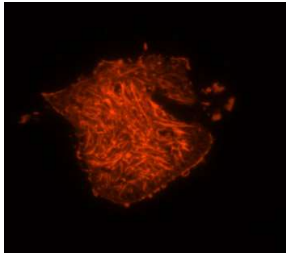
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TIRF: Example

Epi-Fluorescence



TIRF



Phalloidin F-Actin binding protein coupled to Alexa-546 dye, actin filaments, cytoskeleton around the submembrane cortex in bovine cells.

(Dr. Klingauf, MPI für Biophysikalische Chemie, Göttingen)

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Near-field optics

3. Near-field optics

- 3.1 *Theoretical and experimental basis*
 - 3.1.1 *Local detection of optical near-fields*
 - 3.1.2 *Required experimental conditions*
 - 3.1.3 *Optical near-fields at nano-apertures*
- 3.2 *Photon scanning tunneling microscopy*
- 3.3 *Scanning near-field optical microscopy*
 - 3.3.1 *Probe fabrication and optical set-up*
 - 3.3.2 *Surface distance control*
 - 3.3.3 *Single molecule microscopy*

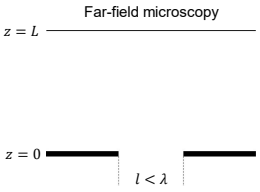
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Detection of Evanescent Fields

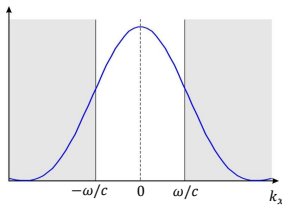
Far-field microscopy

$z = L$



$z = 0$

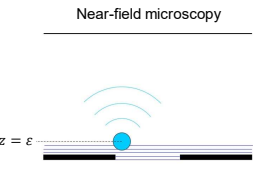
$l < \lambda$



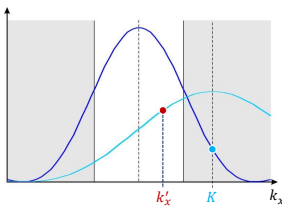
$-\omega/c$ 0 ω/c k_x

Near-field microscopy

$z = \varepsilon$



$\hbar \vec{k}' = \hbar \vec{K} - \Delta \vec{p}$ $k'_x \in \left[-\frac{\omega}{c}, +\frac{\omega}{c} \right]$



k'_x K k_x

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