

Seminar Biophotonik SS2007

Themen:

1. Optical coherence tomography (OCT)

Literatur:

- Optical coherence tomography, Science, Vol 254, Issue 5035, 1178-1181 (1991)
- In vivo endoscopic optical biopsy with optical coherence tomography, Science 276 (5321): 2037-2039 (1997)
- In vivo ultrahigh-resolution optical coherence tomography, Optics Letters 24 (17): 1221-1223 (1999)

2. Stimulated emission depletion (STED) microscopy and applications

Literatur:

- Nanoscale resolution in GFP-based microscopy, Nature Methods 3 (9): 721-723 (2006)
- STED microscopy reveals that synaptotagmin remains clustered after synaptic vesicle exocytosis, Nature 440 (7086): 935-939 (2006)
- Toward fluorescence nanoscopy, Nature Biotechnology 21 (11): 1347-1355 (2003)
- Fluorescence microscopy with diffraction resolution barrier broken by stimulated emission, PNAS USA 97 (15): 8206-8210 (2000)

3. Modern photon detector technology

Literatur:

- <http://www.emccd.com/>
- <http://optoelectronics.perkinelmer.com/catalog/Category.aspx?CategoryName=Single+Photon+Counting+Module>
- http://www.andor.com/library/digital_cameras/?app=326

4. Optically switchable ion channels and applications

Literatur:

- Fast manipulation of cellular cAMP level by light in vivo, Nature Methods 4 (1): 39-42 (2007)
- Channelrhodopsin-1: A light-gated proton channel in green algae, Science 296 (5577): 2395-2398 (2002)
- Channelrhodopsin-2, a directly light-gated cation-selective membrane channel, PNAS U.S.A. 100 (24): 13940-13945 (2003)

5. Optical Tweezer

Literatur:

- A revolution in optical manipulation, Nature 424 (6950): 810-816 (2003)
- Computer-generated holographic optical tweezer arrays, Rev. Sci. Instrum. 72 (3): 1810-1816 (2001)
- Overstretching B-DNA: The elastic response of individual double-stranded and single-stranded DNA molecules, Science 271 (5250): 795-799 (1996)
- Folding-unfolding transitions in single titin molecules characterized with laser tweezers, Science 276 (5315): 1112-1116 (1997)

6. CARS Microscopy

Literatur:

- Coherent anti-Stokes Raman scattering microscopy: Instrumentation, theory, and applications, *J. Phys. Chem. B* 108 (3): 827-840 (2004).
- Laser-scanning coherent anti-stokes Raman scattering microscopy and applications to cell biology, *Biophys. J.* 83 (1): 502-509 (2002)
- Real-time visualization of intracellular hydrodynamics in single living cells, *PNAS U.S.A.* 98 (4): 1577-1582 (2001)
- Chemical selectivity without staining: CARS microscopy, *Nachrichten aus der chemie* 54 (1): 38-41 (2006)

7. Fluorescence correlation spectroscopy

Literatur:

- Sorting single molecules - application to diagnostics and evolutionary biotechnology, *PNAS U.S.A.* 91 (13): 5740-5747 (1994)
- Dual-color fluorescence cross-correlation spectroscopy for multicomponent diffusional analysis in solution, *Biophys. J.* 72 (4): 1878-1886 (1997)
- Biological and chemical applications of fluorescence correlation spectroscopy: A review, *Biochemistry* 41 (3): 697-705 (2002)
- Fluorescence correlation spectroscopy and its potential for intracellular applications, *Cell Biochemistry and Biophysics* 34 (3): 383-408 (2001)

8. Molecular beacons and applications

Literatur:

- <http://www.molecularbeacons.com/>
- Molecular beacons: probes that fluoresce upon hybridization. *Nat Biotechnol* 14, 303-308 (1996).
- Visualizing the distribution and transport of mRNAs in living cells. *Proc Natl Acad Sci USA* 100, 13308-13313 (2003).
- Kinetics of conformational fluctuations in DNA hairpin-loops, *PNAS U.S.A.* 95 (15): 8602-8606 (1998)

9. Realtime PCR

Literatur:

- http://de.wikipedia.org/wiki/Real_time_quantitative_PCR
- <http://pathmicro.med.sc.edu/pcr/realtime-home.htm>
- Quantitation of dihydropyrimidine dehydrogenase expression by real-time reverse transcription polymerase chain reaction, *Anal. Biochem.* 278 (2): 175-184 (2000)
- Detection of gene amplification in archival breast cancer specimens by laser-assisted microdissection and quantitative real-time polymerase chain reaction, *American J. of Pathology* 156 (6): 1855-1864 (2000)
- Single-molecule DNA amplification and analysis in an integrated microfluidic device, *Anal. Chem.* 73 (3): 565-570 (2001)

10. Photosynthesis

Literatur:

- <http://en.wikipedia.org/wiki/Photosynthesis>
- Chlorophyll fluorescence and photosynthesis - the basics, Annual review of plant physiology and plant molecular biology 42: 313-349 (1991)
- Blankenship, R.E., 2002. Molecular Mechanisms of Photosynthesis. Blackwell Science.
- <http://www.life.uiuc.edu/govindjee/photosynBook.html>

11. Resolution enhancement in wide-field microscopy with structured illumination

Literatur:

- Surpassing the lateral resolution limit by a factor of two using structured illumination microscopy, J. Microsc. 198: 82-87 (2000)
- Nonlinear structured-illumination microscopy: Wide-field fluorescence imaging with theoretically unlimited resolution PNAS U.S.A. 102 (37): 13081-13086 (2005)
- Saturated patterned excitation microscopy - a concept for optical resolution improvement, JOSA A 19 (8): 1599-1609 (2002)
- Enhancement of axial resolution in fluorescence microscopy by standing-wave excitation. Nature, 366, 44-48 (1993).

12. Colloidal semiconductor nanocrystals (quantum dots) and applications

Literatur:

- <http://www.evidenttech.com>, <http://probes.invitrogen.com/products/qdot/>
- Water-soluble quantum dots for multiphoton fluorescence imaging in vivo, Science 300 (5624): 1434-1436 (2003)
- In vivo molecular and cellular imaging with quantum dots, Current opinion in biotechnology 16 (1): 63-72 (2005)
- Tracking metastatic tumor cell extravasation with quantum dot nanocrystals and fluorescence emission-scanning microscopy, Nature Medicine 10 (9): 993-998 (2004)

13. FRET and applications

Literatur:

- Fluorescence resonance energy-transfer methods in enzymology 246: 300-334 (1995)
- Probing the interaction between two single molecules: Fluorescence resonance energy transfer between a single donor and a single acceptor PNAS U.S.A. 93 (13): 6264-6268 (1996)
- The renaissance of fluorescence resonance energy transfer, Nature Structural Biology 7 (9): 730-734 (2000)

14. FRAP and applications

Literatur:

- Mobility measurement by analysis of fluorescence photobleaching recovery kinetics, *Biophysical Journal* 16 (9): 1055-1069 (1976)
- Lateral diffusion in phospholipid multibilayers measured by fluorescence recovery after photobleaching, *Biochemistry* 16 (17): 3936-3941 (1977)
- Diffusional mobility of Golgi proteins in membranes of living cells, *Science* 273 (5276): 797-801 (1996)

15. Confocal microscopy: one-photon, two-photon, multi-photon ...

Literatur:

- <http://microscopy.fsu.edu/primer/techniques/confocal/index.html>
- Handbook of biological confocal microscopy, Plenum Press (1995)
- 2-photon laser scanning fluorescence microscopy, *Science* 248 : 73 (1990)
- Confocal microscopy and multi-photon excitation microscopy of human skin in vivo, *Optics Express* 8 (1): 2-10 (2001)

16. Photothermal microscopy

Literatur:

- Photothermal imaging of nanometer-sized metal particles among scatterers, *Science* 297 (5584): 1160-1163 (2002)
- Single nanoparticle photothermal tracking (SNaPT) of 5-nm gold beads in live cells, *Biophys. J.* 91 (12): 4598-4604 (2006)
- Optical readout of gold nanoparticle-based DNA microarrays without silver enhancement, *Biophys. J.* 90 (1): L13-L15 (2006)

17. Single-molecule detection: Stoichiometry, colocalization, position accuracy

Literatur:

- Imaging of single molecule diffusion, *PNAS U.S.A.* 93 (7): 2926-2929 (1996)
- Real-time single-molecule imaging of the infection pathway of an adeno-associated virus, *Science* 294 (5548): 1929-1932 (2001)
- Myosin V walks hand-over-hand: Single fluorophore imaging with 1.5-nm localization, *Science* 300 (5628): 2061-2065 (2003)
- Local stoichiometries determined by counting individual molecules, *Anal. Chem.* 68 (24): 4397-4401 (1996)

18. Optical Biosensors

Literatur:

- Surface plasmon resonance sensors: review, *Sensors and Actuators B-Chemical* 54 (1-2): 3-15 (1999)
- A porous silicon-based optical interferometric biosensor, *Science* 278 (5339): 840-843 (1997)
- Engineered nanomaterials for biophotonics applications: Improving sensing, imaging, and therapeutics, *Annual review of biomedical engineering* 5: 285-292 (2003)