PAUL SCHERRER INSTITUT

PHOTON SCIENCE - SEMINAR

How to Enhance the Flexibility of Optical Imaging and Trapping with Miniature Liquid-Crystal Displays

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DATE:	Friday, September 13, 2013
Coffee:	11:00 h
SEMINAR:	11:15 h
PLACE:	WBGB/019

Abstract:
High resolution LC-based spatial light modulators (SLM) can be used to advance optical imaging and trapping in many ways: Holographic optical tweezers emulated by SLMs have become an indispensable tool in many areas of cell biology because of their enormous flexibility. But these devices may also be integrated into optical imaging, using them, for instance, as a programmable Fourier-filter. One can emulate classic techniques for contrast enhancement, such as dark-field microscopy, Zernike phase contrast, or spiral phase contrast and toggle between these modalities by simply replacing the image displayed on the screen. A major advantage provided by SLMs is the possibility to multiplex images, for example to combine images from different depths of the sample or for different settings of imaging parameters in one recorded image, facilitating e.g. quantitative phase microscopy. Finally, SLM-tailored illumination may also be employed for artifact reduction in linear microscopy or for the fine-tuning of phase-matching in nonlinear CARS-microscopy.

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