Light microscopy with spatial light modulators

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Spatial light modulators (SLMs) such as deformable mirrors or liquid crystal phase modulators are dynamic optical elements that allow shaping the wavefront of light. In the past decades they have been increasingly used in bioimaging applications, to correct for aberrations that are introduced by the optics and specimen, but also to extend the capabilities of microscopes in various ways.

The talk gives a brief introduction to the different kinds of adaptive elements that are commonly used in light microscopy as well as to some key applications.

It then aims at explaining how aberrations can be measured and corrected. Examples from nonlinear microscopy are shown.

A further emphasis is set on the possibilities that are offered by diffractive SLMs. Acting as programmable beam-splitters, they enable multiplexed imaging, i.e. the time-synchronous imaging of a specimen in different modalities or a multitude of focal planes. Benefits and limits of the technique are discussed.