Tomographic diffraction microscopy for full 3D marker-less imaging

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High-resolution microscope is nowadays an essential log of the bio-imaging toolbox. Recent advances involving super-resolution techniques (PALM, STED, STORM, MINFUX…) made it possible to reach a resolution better than 10 nm, thus revealing structural information about investigated cells [1-4]. This high-resolution achievement is made possible at the cost of using fluorescent dyes in the sample preparation, which sometimes can be limiting when *in-vivo* imaging is considered.

Interferometric microscopy techniques can be considered to tackle this problem. Complex information about the investigated medium is here encoded in an interferogram allowing extraction of either amplitude or phase contrast in a three-dimensional volume without fluorescence labeling [5,6]. This is namely the case of digital holography, which allows for numerical reconstruction of a pseudo 3D volume from only one recording [7,8]. Full 3D reconstruction has been demonstrated for example in the framework of tomographic diffractive microscopy (TDM) [9-13]. Here, the object is imaged under several angles of incidence allowing to fully reconstruct the 3D dimensional complex refractive index of the investigated bio-object (see Fig. 1). Moreover, coupling this technique with a sample rotation made it possible to reach 3D-isotropic resolution of **180 nm without fluorescent marker** [14].

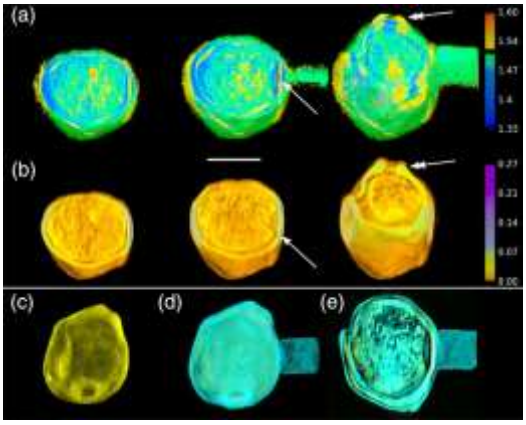

Figure 1. 3D reconstruction of a betula pollen with both index (cyan) and absorption (yellow) contrast. Scale bar is 10 µm. From ref. [14].

This seminar will give the opportunity to present TDM technique and its application to marker-less 3D imaging of biological samples

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