

par **Julio C. DA SILVA**
European Synchrotron Radiation Facility
Grenoble

Quantitative label-free super resolution microscopy by ptychography and Fourier ptychography

Although super-resolution microscopy approaches such as stimulated emission depletion microscopy (STED), photoactivated localization microscopy (PALM) and stochastic optical reconstruction microscopy (STORM) have revolutionized bio-imaging, they are based on the excitation of bio-markers in the sample. The nature of the photo-physical process in the excitation of a fluorophore and the emission of fluorescent light often leads to side effects of photo-bleaching and photo-toxicity. Therefore new quantitative label-free high resolution microscopy methods open new opportunities to image samples beyond the diffraction limit and with relatively large field-of-view and high depth-of-focus.

We will present one of these innovative label-free microscopy methods, which is ptychography. Such a method provides quantitative super-resolution images and can be performed with different types of probes: optical, X-ray or electrons. Two of its variants will be discussed: conventional ptychography and Fourier ptychography. Conventional ptychography is a scanning microscope method that has recently provided image with the highest resolution ever in the regimes of X-rays and electrons. The Fourier ptychography is the counterpart to conventional ptychography and it is typically implemented in the visible light regime.

We will discuss the applications of Fourier ptychography to digital pathology and cell imaging, without staining, allowing high-resolution imaging of a large area of biological tissues. We will also present the applications of conventional X-ray ptychography to study bulky samples, like entire cells or tissues where X-ray penetration is necessary. Although not discussed in details, we will show that electron ptychography has demonstrated the highest-resolution ever in electron microscopy and entered into the Guinness book.

Hôte : Leandro Estrozi (IBS/Groupe de Microscopie Electronique et Méthodes)