

## **Hard X-ray nano-tomography for life sciences**

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Recent advances in hard X-ray microscopy make possible reaching new levels of resolving power in thick biological samples. Thanks to high brilliance coherent beams combined with cutting-edge nano-focusing optics and high precision tomographic scanning, X-ray holography can probe the 3D structure of up to millimeter sized tissues at tens of nanometers spatial resolution. This opens new horizons for life sciences research, enabling to bridge scales and address questions previously unreachable. A prominent example is deciphering the structure and logic of neuronal circuits and their evolution with aging and diseases. This talk will cover recent results obtained at the nano-imaging beamline ID16A of ESRF related to both fundamental life science questions and exploration of underpinnings and potential treatments for diseases such as Alzheimer's, diabetes, multiple sclerosis or cancer. The ID16A setup is equipped with a cryogenic system, enabling imaging of vitrified samples and offering better preservation from radiation exposure. Besides phase contrast imaging, the instrument includes high precision X-ray fluorescence imaging enabling to map and quantify the native elemental composition of cells and tissues. We will discuss the opportunities offered by these technologies, the current challenges to address, and perspectives in the context of the development of the fourth generation synchrotron sources.