

## SYNCHROTRON BASED SPECTRO-MICROSCOPY FOR CELL BIOLOGY

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Very little is known about the sub-cellular distribution of metal ions in cells. Some metals such as zinc, copper and iron are essential cations fulfilling fundamental biological functions in all living cells. They are for instance involved in the transport of electrons, energy metabolism or DNA synthesis. Also, a wide diversity of enzymes has a metal co-factor. As recognized by the emerging field of *metalloneurochemistry*, metals are intimately involved in key neural processes. Synchrotron based X-ray microprobe is becoming a well suited micro-analytical tool to address new problems in this broad area.

As a complementary tool to optical and electron microscopes, developments and studies demonstrated the unique capabilities of multi-keV microscopy: namely ultra-low detection limit, large penetration depth, chemical sensitivity and three-dimensional imaging capabilities. More recently, the capabilities of instruments were extended towards sub-100nm spatial resolution enabling sub-cellular nanochemical imaging of trace elements.

This presentation will be based towards X-ray microscopy developed at the ESRF. Strengths and weaknesses of X-ray microscopy and spectro-microscopy techniques in the 2-20keV energy range will be discussed and illustrated by examples. A focus will be given to the studies on roles of metal in neurodegenerative diseases. Finally, latest strategies, involving new geometries and combination of techniques will be presented.