

Correlative Soft X-ray Tomography and Cryo-Fluorescence Microscopy for adherent cells

Zi-Jing Lin (林子敬)¹, Chia-Chun Hsieh (謝嘉濬)¹, Dapi Meng-Lin Chiang (江孟霖)², Tsung-Wen Chen (陳宗彬)¹, Huan-Yuan Chen(陳煥源)², Pang-Hsien. Tu (杜邦憲)², Fu-Tong Liu (劉扶東)², and Lee-Jene Lai (賴麗珍)¹

¹National Synchrotron Radiation Research Center, Hsinchu, Taiwan

²Institute of Biomedical Science, Academia Sinica, Taipei, Taiwan

Abstract

Discover the ultrastructure inside the cell is one of the major goals in cell biology research. Soft X-ray Tomography (SXT) is a synchrotron-based imaging technique to see the ultrastructure of fully hydrated intact cells [1] as cells were only frozen without staining and processing. SXT provides morphological information of subcellular organelles at nanometer scale resolution in three dimensions (3D). However, for those organelles with similar shapes or contrast, it is difficult to identify by morphology alone. The combination of complementary imaging techniques is always beneficial to biomedical researchers to answer biological questions. Fluorescence microscopy has been widely used to track the specific organelles/molecules by labeling with a fluorescent dye or expressing of the fluorescent protein. However, it is limited to visualize the structures with fluorescent labeled and unable to visualize locations relative to other unlabeled organelles. Coupling between SXT and fluorescence microscopy is able to provide complete information of organelles on both morphology and function.

In this project, we show the example [2] of employing the in-line cryo-fluorescence microscopy or conventional fluorescence microscopy with stand-alone cryo-stage to guide SXT and to navigate the targeted region of interest (ROI) in cells.

Keywords- *SXT, Cryo-fluorescence Microscopy*

References

- [1] F. J. Chichon, *et al.*, "Cryo X-ray nano-tomography of vaccinia virus infected cells," *J Struct Biol*, vol. 177, pp. 202-11, Feb 2012.
- [2] H.-Y. Chen, *et al.*, "Nanoimaging granule dynamics and subcellular structures in activated mast cells using soft X-ray tomography," *Sci. Rep.* **6**, 34879, 2016