

# Sub-cellular Whole Brain Mapping with Synchrotron X-rays

**Yeukuang HWU**

(Institute of Physics, Academia Sinica, Taipei, Taiwan)

Lauréat du prix France-Taiwan de l'Académie des Sciences de France

**Lundi 20 janvier 2020 – 14h00**  
**Amphithéâtre SOLEIL**

The new capability of high spatial and temporal resolution by the integration of micro- and nano-tomography is best for neurobiology. The complexity of the complete neural networks is beyond the current technology to describe, analyze and understand. Comprehensive mapping of neural networks in the brain is therefore a formidable but very exciting challenge. One of the essential step towards understanding brain functions is to construct a basic circuit map – a connectome – showing the neural network at the level of single neurons and connections.

Could x-ray techniques be the tool of choice to challenge the animal brain connectome mapping? Is the overall performance adequate, however? Our positive results show that there are two additional directions need to be further improved: an even better spatial resolution and higher probe depth, both are relevant to the high brightness synchrotron radiation and new nanofabrication facilities. As one of the six “high priority challenges” in the US BRAIN Initiative: “Maps at multiple scales: Generate circuit diagrams that vary in resolution from synapses to the whole brain”, we believe x-ray imaging will transform this vision into reality with these improvements.

An effective strategy based on recent advances in synchrotron x-ray tomography reaches three critical objectives: (1) three-dimensional (3D) imaging with high and isotropic spatial resolution; (2) fast image taking and processing, as required for comprehensive whole-brain mapping within a reasonable time, and (3) multi-scale resolution, to zoom into specific regions of interest. We tested the strategy by mapping large populations of metal-labeled neurons and their connections in two animal models, *Drosophila* and mouse. Its speed notably allowed full 3D mapping of the *Drosophila* brain in a few days. Further improvements are underway, and an Asia-Pacific synchrotron alliance is now ready to target the challenge task of comprehensive sub-cellular mapping of large animal brains.



**Ce séminaire sera suivi d'une pause café**

**Formalités d'entrée :** accès libre dans l'amphi du pavillon d'Accueil.  
Si la manifestation a lieu dans le Grand Amphi SOLEIL du Bâtiment Central merci de vous munir d'une pièce d'identité (à échanger à l'accueil contre un badge d'accès)

SYNCHROTRON SOLEIL  
L'Orme des merisiers - Saint-Aubln - BP48 - 91192 GIF S/YVETTE cedex

[www.synchrotron-soleil.fr/fr/evenements](http://www.synchrotron-soleil.fr/fr/evenements)  
CONTACT : [sandrine.vasseur@synchrotron-soleil.fr](mailto:sandrine.vasseur@synchrotron-soleil.fr)

**SEMINAIRE**