

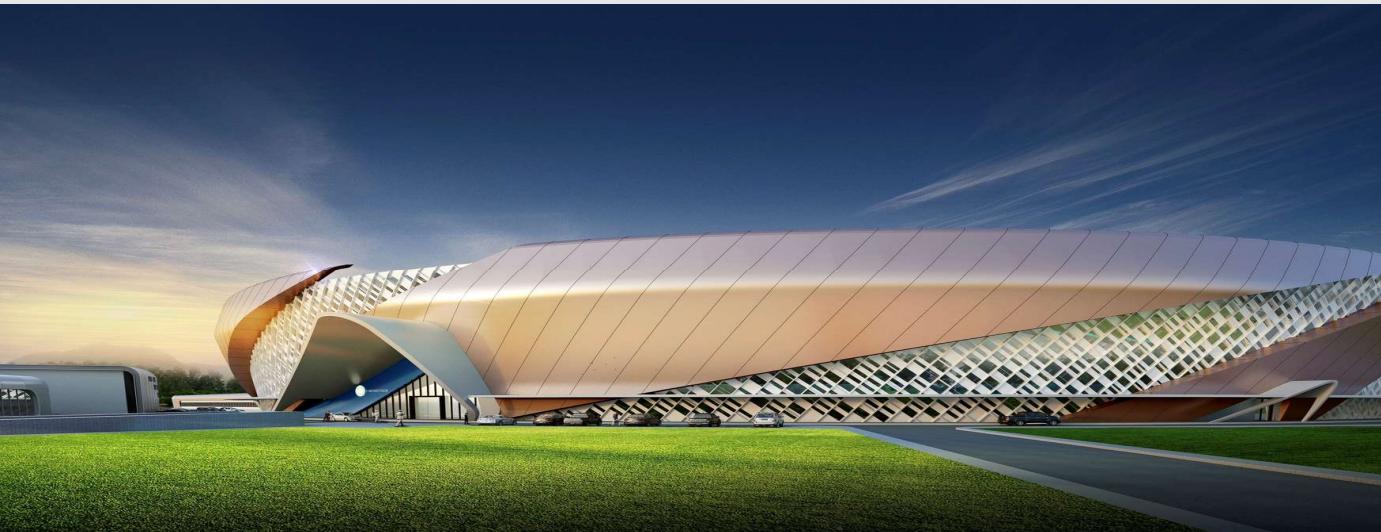


# SYNAPSE

**Asia-Pacific consortium for human brain mapping with synchrotron XTM**

**Supagorn Rugmai**

Synchrotron Light Research Institute (Public Organization)





SYNCHROTRON FOR NEUROSCIENCE – AN ASIA-PACIFIC STRATEGIC ENTERPRISE

# SYNAPSE

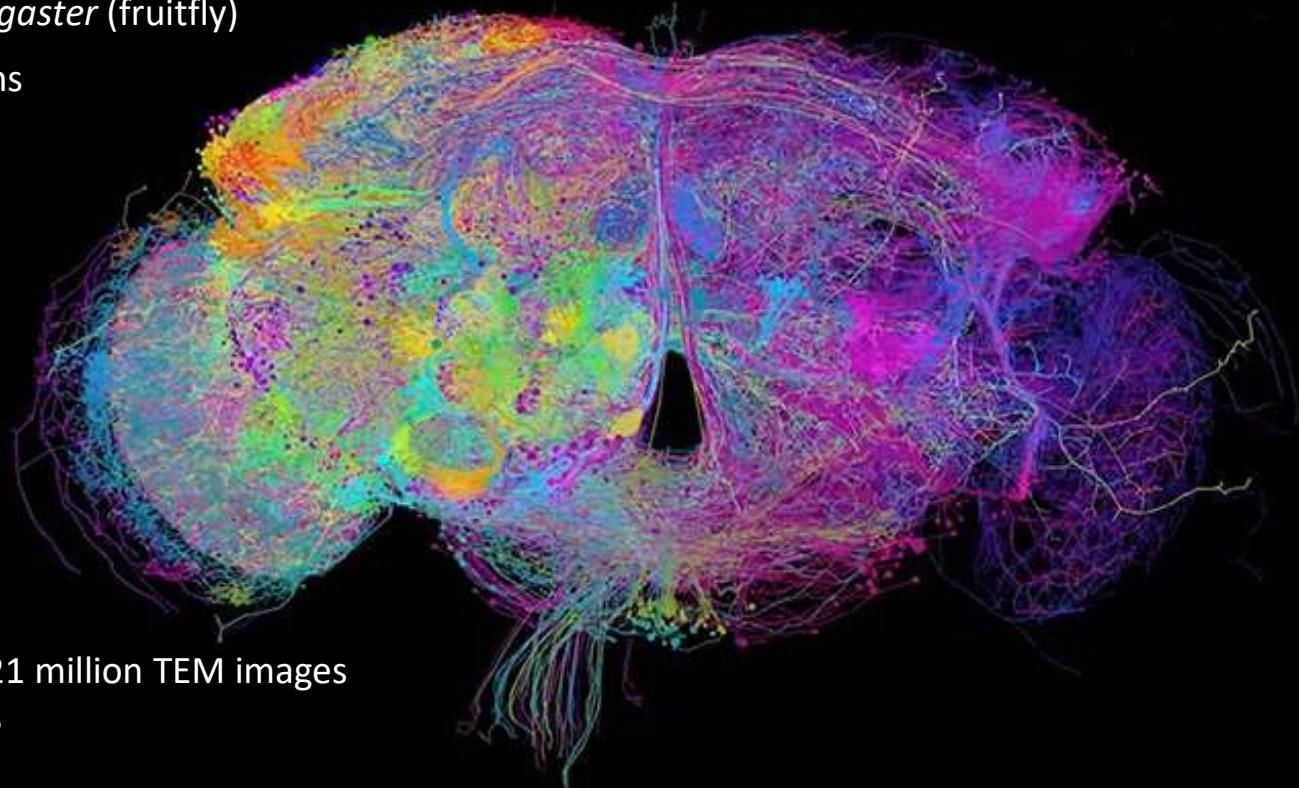


MAPPING THE NEURONAL NETWORK OF THE ENTIRE HUMAN BRAIN

# Fruit fly brain

*Drosophila melanogaster* (fruitfly)

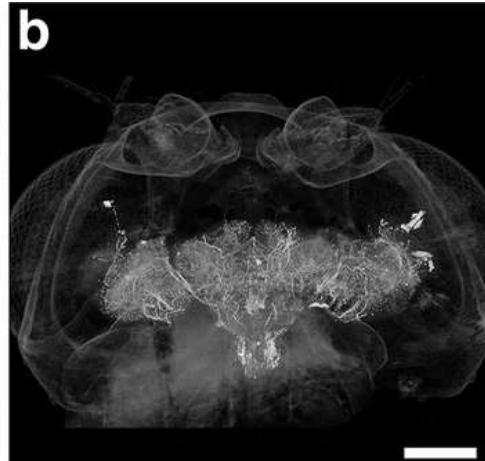
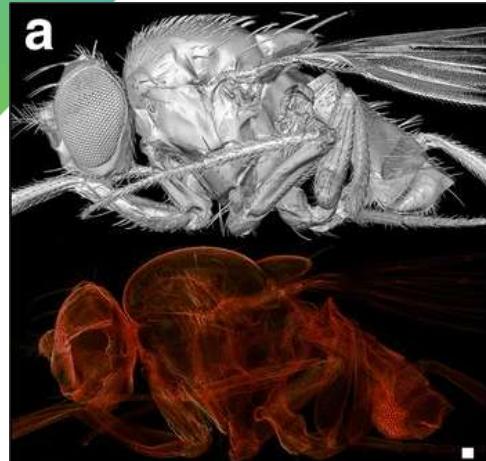
100,000 neurons



Constructed from 21 million TEM images  
of 7000 brain slices

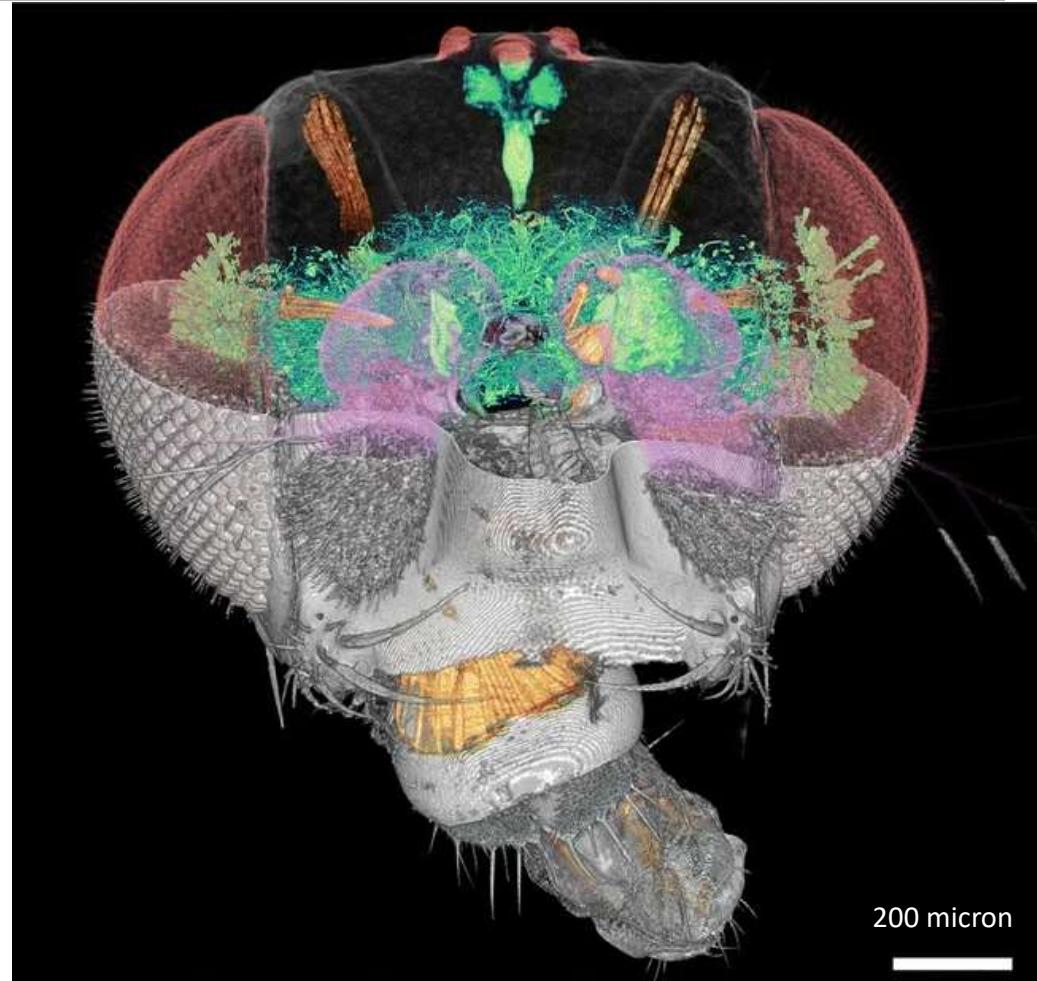
Z. Zheng et al., Cell 2018

# Fruit fly brain



Synchrotron XTM of  
*Drosophila melanogaster*

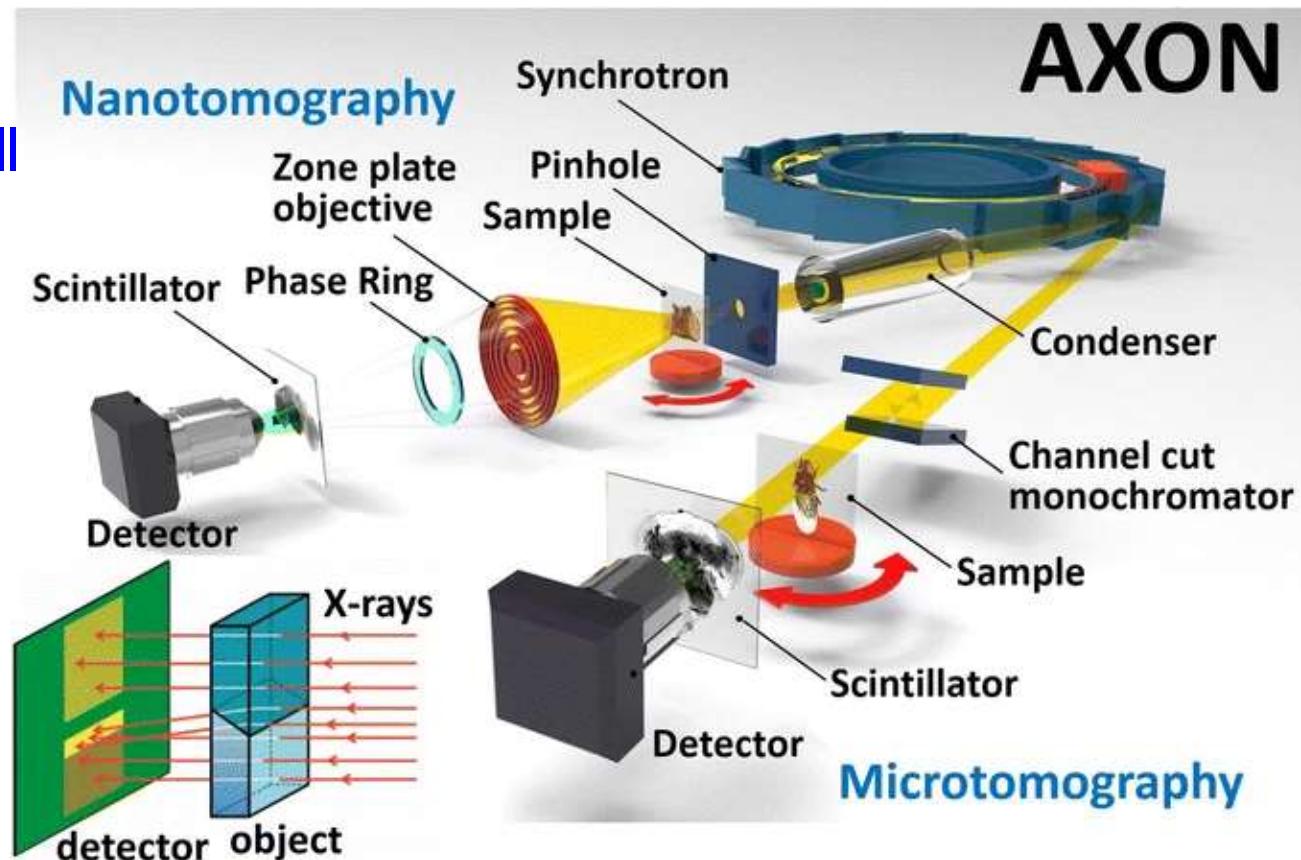
A complete high resolution 3D image can be taken  
in minutes.



# 3D Brain imaging with synchrotron X-ray

X-ray nano and micro tomography beamlines at Taiwan Photon Source and Pohang Light Source

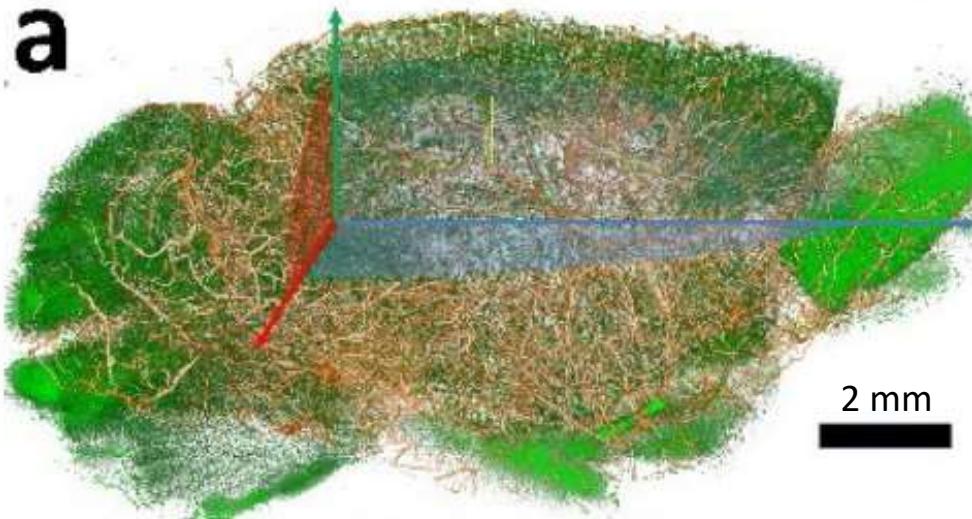
SPS-II



AXON

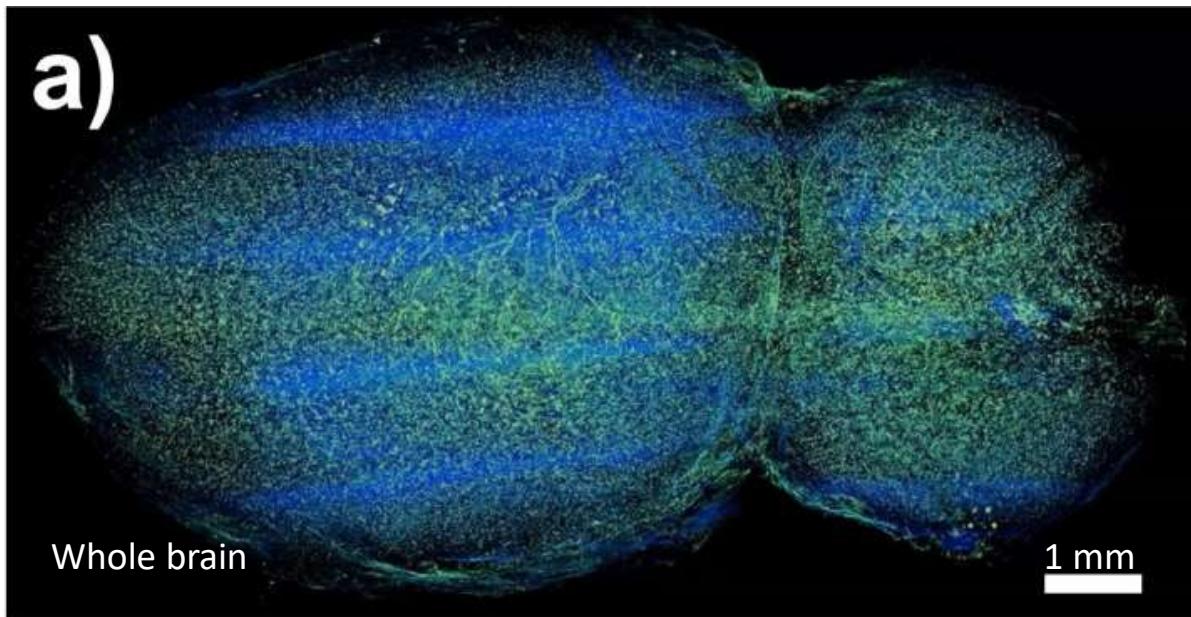
**Nanotomography**      **Microtomography**      **SPS-I**

# 3D Brain imaging with synchrotron X-ray



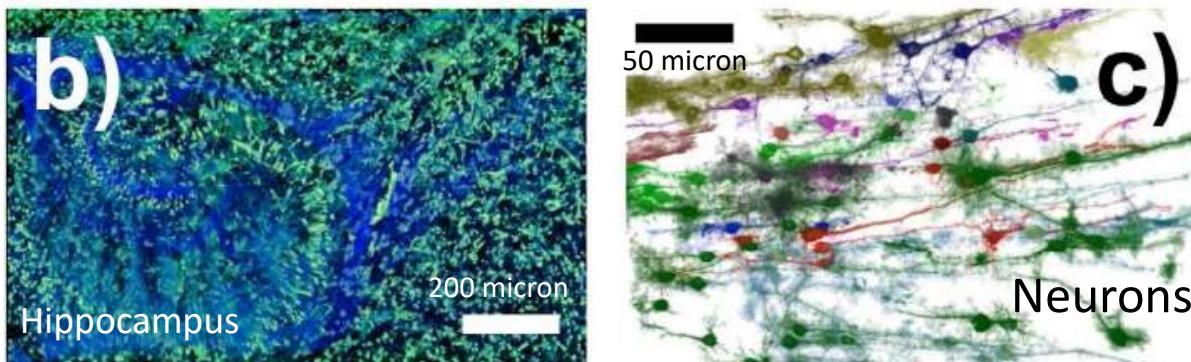
Synchrotron XTM of Mouse brain. Gold: Blood vessels , Green: Neuron network

# 3D Brain imaging with synchrotron X-ray



Synchrotron XTM of  
mouse brain.

70 million neurons



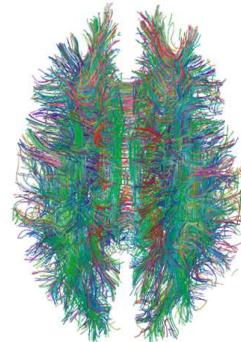
A.P.J. Stampfl et al., Phys. Rep. 2023

# 3D Brain Human Brain Mapping

Human brain  
86 billion neurons  
1 quadrillion synapses

EM images of the whole human brain would take  
hundreds of years.

Collaboration of 7 synchrotrons will take < 2 years



By Xavier Gigandet et. al. - Gigandet X, Hagmann P, Kurant M, Cammoun L, Meuli R, et al. (2008) Estimating the Confidence Level of White Matter Connections Obtained with MRI Tractography. PLoS ONE 3(12): e4006. doi:10.1371/journal.pone.0004006, CC BY 2.5, <https://commons.wikimedia.org/w/index.php?curid=8134159>

Physics Reports 999 (2023) 1–60

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# SYNAPSE Consortium



# Thank you

