Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Nanotomography of brain networks RINO SAIGA, RYUTA MIZUTANI, Dept of Applied Biochemistry, Tokai Univ, SUSUMU TAKEKOSHI, MOTOKI OSAWA, Tokai Univ School of Medicine, MAKOTO ARAI, Tokyo Metropolitan Institute of Medical Science, AKIHISA TAKEUCHI, KENTARO UESUGI, YASUKO TERADA, YOSHIO SUZUKI, Japan Synchrotron Radiation Research Institute / SPring-8, VINCENT DE ANDRADE, FRANCESCO DE CARLO, Advanced Photon Source, Argonne National Laboratory — The first step to understanding how the brain functions is to analyze its 3D network. The brain network consists of neurons having micrometer to nanometer sized structures. Therefore, 3D analysis of brain tissue at the relevant resolution is essential for elucidating brain's functional mechanisms. Here, we report 3D structures of human and fly brain networks revealed with synchrotron radiation nanotomography, or nano-CT. Neurons were stained with high-Z elements to visualize their structures with X-rays. Nano-CT experiments were then performed at the 32-ID beamline of the Advanced Photon Source, Argonne National Laboratory and at the BL37XU and BL47XU beamlines of SPring-8. Reconstructed 3D images illustrated precise structures of human neurons, including dendritic spines responsible for synaptic connections. The network of the fly brain hemisphere was traced to build a skeletonized wire model. An article reviewing our study appeared in MIT Technology Review. Movies of the obtained structures can be found in our YouTube channel.

Ryuta Mizutani
Dept of Applied Biochemistry, Tokai Univ

Date submitted: 01 Nov 2016 Electronic form version 1.4