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Retrieving Myelin/Nerve Fibers in a Brain Section by Small Angle Scattering

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The investigation of fiber distribution and myelin orientation in the brain has received increasing attention in recent years, as the 3D fiber structure reveals the connectivity of the axonal network (connectome) that is necessary to understand dysfunctions of the brain [1]. Hence, we adapt scanning small angle neutron/x-ray scattering (sSANS/sSAXS) to map an entire brain section of a mouse and to investigate the microstructural insights of the anatomical regions in the tissue [2-3]. We extract the orientation and spatial distribution of the nerve fibers and determine their degree of orientation in the section. Moreover, we quantify the orientation of myelin sheaths and their assembly from the myelin Bragg peaks across the section. Finally, we illustrate the potential of scanning SAS by comparing the result with the fiber orientation maps (FOM) of 3D polarized light imaging (PLI) in the same brain [4-5]. In the future, the scanning neutron/x-ray can serve as an alternating technique for imaging other biological tissues.

[1] Y. Shi et al., *Molecular Psychiatry* 22, 1230-1240 (2017). [2] H. Inouye et al., *PLOS One*. 9, e100592, (2014). [3] M. Georgiadis et al., *NeuroImage*, 204, 116214 (2020). (2015). [4] M. Axer et al., *Front. Neuroinform.*, 5, 34 (2011). [5] S. Maiti, S. Förster et al., (submitted).

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