Ex vivo approaches for investigating the brain's circuitry: The what, the how & the why

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Diffusion MRI (dMRI) in vivo has proven to be a powerful technique for studying the anatomy of fiber bundles in the brain, with new developments aiming to overcome challenges in data resolution and to achieve higher fidelity in fiber orientation reconstruction techniques. With ex vivo dMRI being able to bridge the gap from the in vivo world to meso-scale configurations (in the range of 200-300 microns), histological techniques are able to go down even further to the micro-scale for reconstructing nerve fibers. In addition to ex vivo dMRI, we cover three other ex vivo methods, which are currently being used to further our understanding of the brain's microstructural and architectural tissue characteristics, i.e., optical coherence tomography (OCT), 3D-polarized light imaging (3D-PLI), and CLARITY. The complementary information from these four ex vivo methods may generate valuable insight into the underlying fiber architecture and could address many challenges these days in studying structural connections. The audience should learn about the potentials and pitfalls of each technique in light of particular research questions. This is particularly assured by a diversity of speakers who each focus on one of these techniques, while also considering potential links and complementarity between the approaches.

Post-mortem diffusion imaging for multi-scale neuroscience: Anatomical insights and links to microscopy
Saad Jbabdi, FMRIB Centre, *University of Oxford, Oxford, United Kingdom*

Fiber tracts and intracortical fibers in parieto-occipital cortex using 3D-polarized light imaging
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Visualization of the myeloarchitecture and the cytoarchitecture of the human brain by Optical Coherence Tomography
Caroline Magnain , Athinoula A. Martinos Center for Biomedical Imaging and Harvard Medical School Boston, United States

Clearing, staining and imaging of intact brain specimen using CLARITY
Christoph Leuze, Stanford University, Stanford, CA, United States