HIGH CAPACITY WHOLE SLIDE IMAGING IN NEUROSCIENCE

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Whole Slide Imaging (WSI), also sometimes called virtual slide imaging produces images that simultaneously provide high resolution and a wide field of observation that can encompass the entire section, extending far beyond any single field of view. For example, a brain slice can be imaged so that both overall morphology and individual neuronal details can be seen.

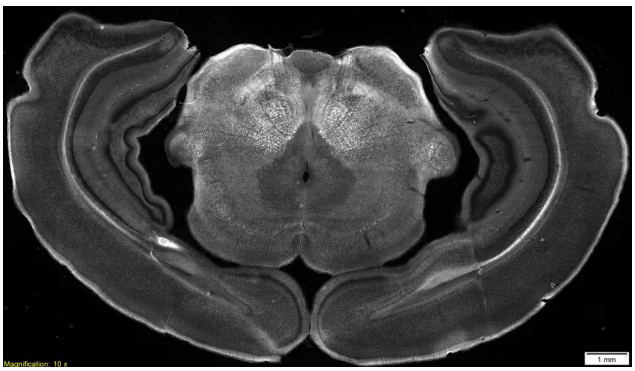
Modern slide scanning systems like the Olympus VS120 FL combine high resolution multi-channel fluorescence scanning with a slide loader device to facilitate the processing of large slide collections.

The application of WSI in Neurobiology is the study of cells of the nervous system (principally neurons and glial cells) and the organization of these cells into functional circuits able to process information and mediate behaviour.

The large field of view is an advantage as the brain has complicated and inter-tangled masses of neural networks and structures that extend beyond the field of view of almost any conventional microscope objective lens.

One of the most powerful applications of WSI is the ability to scan a complete set of serial sections within a brief period of time.

The Mouse Connectome Project (MCP) is an NIH-funded project that aims to create a complete mesoscale connectivity atlas of the C57Black/6 mouse brain and to subsequently generate its global neural networks. This will help researchers gain a better understanding of how different brain structures organize into networks and how they communicate with one another to influence behaviour.



In this lecture we present imaging data of Marina Garrett from Professor Edward Callaway's Lab (Waitt Advanced Biophotonics Center at The Salk Institute for Biological Studies). The mouse brain was sectioned into 140 slices with neurons expressing a GFP protein of interest, a mCherry protein of interest and counterstained with DAPI. The sections were individually imaged on Olympus™ VS120 slide scanner at 20X. The individual slices were then aligned and coordinated using AutoAligner (Bitplane) generating a 3D volume. Imaris (Bitplane) was utilized to generate 3D reconstructions of the GFP and mCherry expressing neurons. The dendritic projections were statically color coded based on length.