

Multi-view and multi-sample light-sheet imaging from a microscopy facility point of view

The Francis Crick Institute is a young, large and ambitious biomedical research centre that aims to understand the biology underpinning human health. The Crick Advanced Light Microscopy facility (CALM) supports basic and advanced light microscopy with the institute. We recently acquired a Luxendo-Bruker MuVi light-sheet microscope in order to support research in many different fields, including developmental biology, stem cells, infections, cancer, immunology, neuroscience. This microscope is characterized by a double illumination and detection system and is ideal for imaging small living samples. However, due to the large variety of sample (and users) that we have to deal with (early embryos, organoids, small fixed organs, etc.) optimization of imaging settings can be challenging and not always possible. Here we describe the strategy we adopted for helping scientists to best exploit the potentiality of the MuVi SPIM and we discuss the limits and benefits of this commercial microscope. First of all, introduction to light-sheet theory and microscope training strongly benefited from intense visual supports and 3D models of both Gaussian beam and biological samples. Then, specimen preparation has been optimized using different glass capillaries, loading systems and FEP tubes-based chambers for imaging fragile, cleared or Matrigel-embedded objects. Specimen imaging has been improved using an additional small digital microscope and comparing different beam positions or sample orientations. Data processing has been optimized using a dedicated computer connected to the institute server by InfiniBand and easily accessible by desktop remote control. We are currently optimizing the image fusion process and the photo-stimulation module. Many of these expedients can help to better perform light-sheet imaging with the MuVi SPIM in a microscopy facility that is daily challenged by a wide range of different samples and biological questions.

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Session Classification : Posters