***Light sheet microscopy for fast 3D imaging of living samples***

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In Light Sheet Fluorescence Microscopy (LSFM), a sheet of excitation light is produced in to the sample plane and the generated fluorescence is then collected using a microscope objective placed orthogonally to the excitation light sheet plane. LSFM allows for a highly efficient excitation and collection of the generated signal. Altogether, such scheme minimise light dose onto the sample and results in a decreased photobleaching, reducing thus phototoxic effects. Therefore LSFM is ideal for 3D imaging and long term observation of in vivo biological samples.

I will present our efforts for achieving high throughput, long term imaging of different samples. In this case, our setup is based a fluidic system based on the use of a FEP tube and a syringe pump. Other modalities allowed by the setup will be explained. Then, I will present a LSFM microscope for fast volumetric imaging. In this case, the observation arm of the microscope contains an electrically tunable lens (ETL). I will present our results for 3D imaging the spontaneous Ca2+activity in of primary neuron cultures in hydrogels. The field of view is of 300µm x 300µm x 1mm. The imaging speeds allows a proper sampling of the propagation of GCaMP signal in the full observation volume. The obtained data is then processed to calculate the connectivity maps in the 3D neuron cultured in hydrogels.