Selected biomedical applications in Light sheet microscopy

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In Light sheet fluorescence microscopy (LSFM), a sheet of excitation light is produced onto the sample plane. The generated fluorescence is then collected using a microscope objective placed orthogonal to the excitation light sheet plane. LSFM allows for a highly efficient excitation and collection of the generated signal. Altogether, such scheme minimises light dose onto the sample and results in a decreased photobleaching, reducing thus phototoxic effects [1].

LSFM has been put forward as an interesting candidate for fast volumetric imaging of biological samples. Here, I will present our efforts for achieving fast 3D imaging for high through put applications based a fluidic system based on the use of a FEP tube and a syringe pump [2, 3]. During the second part, I will present a LSFM microscope for fast volumetric imaging based on the use of an electrically tunable lens (ETL) [3,4]. This system is used to image the spontaneous Ca^{2+}activity, as reported by GCaMP fluorescence. Finally, I will present the use of wavefront coding (WFC) combined with machine learning in a light sheet fluorescence microscopy (LSFM) system to visualize the 3D dynamics of sperm flagellar motion [5].

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