



Enrico Fermi colloquium

Friday 16 December 2011 – 11:00 am

LENS - Via Nello Carrara 1 - Sesto Fiorentino (Firenze)

Conference room *Querzoli*

Multidimensional fluorescence imaging and metrology for cell biology, drug discovery and label-free diagnosis

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Abstract

This talk will review our development and application of multidimensional fluorescence imaging and metrology technology, with a particular emphasis on fluorescence lifetime imaging (FLIM), applied to microscopy, HCA endoscopy and tomography with the potential to translate molecular readouts across the scales. For cell biology we have developed FLIM microscopes including a STED FLIM microscope for super-resolved multi-label imaging and high-speed optically sectioned FLIM microscopes for rapid 3-D imaging, including of FLIM FRET readouts in live cells. For drug discovery we have this to automated optically sectioned FLIM/FRET multiwell plate readers that can image a 96 well plate in less than ~15 minutes. With its associated analysis software, this technology makes FLIM a practical tool for HCA including for live cell assays. For drug discovery and for fundamental biomedical research, it is increasingly imperative to translate cell-based assays to in vivo studies. Accordingly, we are developing tomographic FLIM instruments including FLIM optical projection tomography, which we have applied to live zebrafish embryos and diffuse FLIM tomography, with which we have demonstrated in vivo FLIM FRET in a mouse model. For imaging larger disease models and patients, we are developing a range of FLIM endoscopes including a FLIM confocal endomicroscope, wide-field FLIM endoscopes and single point fibre-optic multidimensional fluorescence probes to provide more detailed information on complex spectro-temporal autofluorescence signals. These instruments are complemented by clinical multiphoton multispectral FLIM tomography, from which we are obtaining in vivo data.