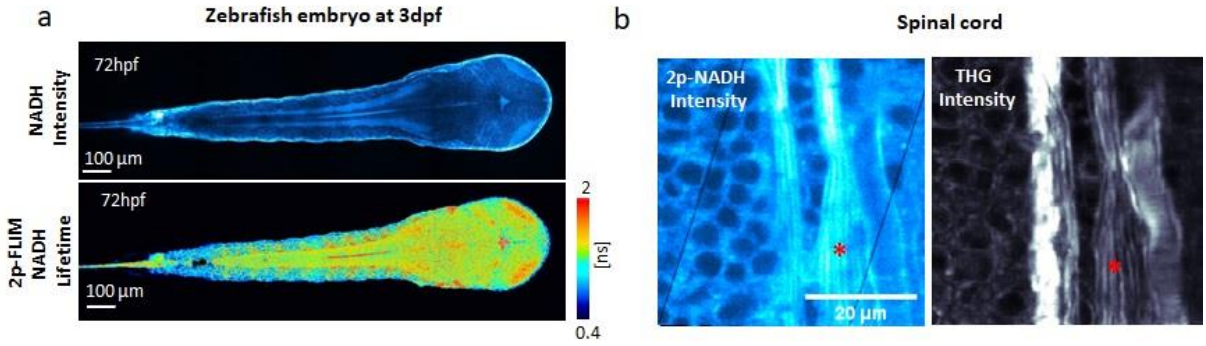
Title : ***In vivo* nonlinear optical microscopy of nervous tissue: lipid and metabolism imaging**		
First Name : Chiara	**Name** : Stringari	**Laboratory** : LOB
First Name : Emmanuel	**Name** : Beaurepaire	**Laboratory** : LOB
Email : chiara.stringari@polytechnique; emmanuel.beaurepaire@polytecnhique.edu		
Webpage : https://lob.ip-paris.fr/recherche/microscopies-avancees/flim-based-metabolic-imaging https://lob.ip-paris.fr/recherche/microscopies-avancees/third-harmonic-generation-thg-microscopy		
Research Area Biophysics, Optics		
Methods: Non-linear Optical microscopy: polarization-resolved third harmonic generation (P-THG), 2-photon excited fluorescence (2P), Fluorescence Lifetime Microscopy (FLIM), metabolic imaging		

PhD track subject Our research focuses on the development of non-linear optical microscopy with endogenous (label-free) signals to study the structure and function of live tissues with sub-cellular resolution. In close collaboration with the *Brain & Spine Institute* we develop non-invasive imaging and biophotonics applications to study physiopathological processes of the nervous system. The project aims at implementing advanced fluorescence lifetime imaging (FLIM) to investigate the metabolic states of cells and polarized third-harmonic generation microscopy (THG) for probing myelin distribution and organization in healthy and pathological brain tissues and *in vivo* zebrafish models.



(a) 2P-FLIM of the metabolic biomarker NADH in an unstained zebrafish embryo at 3 days post fertilization (dpf) reveals spatial metabolic patterns at the embryo level, brain and cellular level
(b) 2P Intensity and THG intensity reveals the distribution of NADH and myelin in the neuronal axons (*) of the zebrafish spinal cord *in vivo.*

References:

Label-free imaging of red blood cells and oxygenation with color third-order sum-frequency generation microscopy J. Ferrer Ortas, P. Mahou, S. Escot, C. Stringari, N. B. David, L. Bally-Cuif, N. Dray, M. Négrerie, W. Supatto, E. Beaurepaire **Light: Science & Applications** (2023). DOI: 10.1038/s41377-022-01064-4

Coordinated metabolic transitions and gene expression by NAD+ during adipogenesis E. Sánchez-Ramírez, T.P.L. Ung, A. Alarcón del Carmen, X. del Toro-Ríos, G.R. Fajardo-Orduña, L.G. Noriega, V.A. Cortés-Morales, A.R. Tovar, J.J. Montesinos, R. Orozco-Solís, C. Stringari, L. Aguilar-Arnal. **J Cell Biol** 221(12), e202111137 (2022). DOI: 10.1083/jcb.202111137

Simultaneous NAD(P)H and FAD fluorescence lifetime microscopy of long UVA–induced metabolic stress in reconstructed human skin. T.P.L. Ung, S. Lim, X. Solinas, P. Mahou, A. Chessel, C. Marionnet, T. Bornschlögl, E. Beaurepaire, F. Bernerd, A.-M. Pena, C. Stringari **Scientific Reports** 11, 22171 (2021). DOI: 10.1038/s41598-021-00126-8