INT Symposium on “Advanced Photonic Imaging in Neuroscience”

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DEBARBIEUX Franck

Assistant Professor (AMU)

franck.debarbieux@univ-amu.fr

Team ‘Live imaging of cell interactions in the normal and diseased brain’ (ImaPath)

Institut de Neurosciences de la Timone (INT), CNRS UMR 7289, Aix Marseille Université, Marseille France

Franck Debarbieux is the leader of the IMAPATH team at the Institute for Neuroscience Timone (AMU-CNRS, France). Initially graduated as an engineer in physics and chemistry from E.S.P.C.I. (Paris-Tech Grande Ecole, 1997), he obtained a PhD in Neuroscience from Paris 6 University (2002) and was hired as a Research Scientist at RIKEN Brain Science Institute in Japan. In 2005 he became Assitant Professor at Aix Marseille University and devoted himself to preclinical brain imaging. His team takes advantage of multicolor 2P and CARS microscopies to study the dynamic neuroinflammatory processes at play in the pathological central nervous system as well as their impact on neuronal functions. The methodological and fundamental efforts of the team are finally transferred to applicative research in the context of the European FET project (Neurofibres) to develop neuroregenerative prosthetic implants.

S4-L2 ‘*Intravital microscopic investigation of demyelination and neurodegeneration in the mouse spinal cord.*’

Demyelination and subsequent neurodegeneration are common features of most neurodegenerative diseases including Multiple Sclerosis. Because demyelinating events are tightly regulated at the subcellular and molecular scales, microscopic optical techniques are best suited for their mechanistic analysis. In the mouse spinal cord, we show that Coherent anti-Stokes Raman scattering (CARS) reports the density of lipidic chemical bond and thus gives insight into the status of myelin sheath around axons. Combined to spectral two photon microscopy, CARS can be used to describe the attack of myelin by immune cells in neuropathologies and to clarify its impact on neurodegenerative events. Implementation of a polarized version of the technique further gives access to the molecular organisation of the lipids which can be used as early stage markers of Experimental Autoimmune Enceyphalomyelitis disease. Intravital implementation of this polarization technique is expected to demonstrate the predictive value of lipid molecular order with regard to pathological evolution.