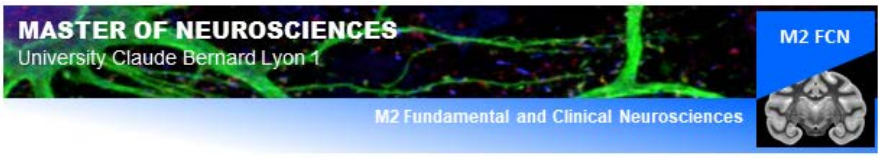

MASTER 2 Fundamental and Clinical Neurosciences

Internship proposal 2024-2025

(internship from January to June 2025)

Host laboratory: LabTAU (INSERM U1032, CLB, UCBL)

Host team : LabTAU (INSERM U1032, CLB, UCBL) - http://labtau.univ-lyon1.fr/

Internship supervisors:

- W. Apoutou N'DJIN, Senior Research Associate (LabTAU), apoutou.ndjin@inserm.fr
- Ivan SUAREZ, Research Associate (LabTAU), ivan.suarez@inserm.fr
- Sandrine PARROT, Research Engineer (CRNL), sandrine.parrot@univ-lyon1.fr

Project title: *Sonic Solutions: Harnessing Focused Ultrasound for Targeted Neurostimulation Studies*

Project summary:

Focused ultrasound (FUS) neurostimulation is a rapidly expanding field for the treatment of neurological and psychiatric disorders. Despite the rapid growth of this field, a fundamental understanding of the underlying mechanisms is necessary to further accelerate its transfer to the clinic. In recent years, our group has conducted preclinical studies exploring the immediate and causal stimulation effects of FUS, down to single FUS pulses[1-5]. This project will consist in the investigation of the physical, biological and chemical mechanisms involved in this phenomenon. Hybrid platforms will be used to describe the electrochemical and electrophysiological responses produced by application of FUS sequences on different neural models ranging from *in vitro* neural cultures, to *in vivo* giant axons of the common earthworm, to *in vivo* full brain studies on rodent models. The aim of this master's or engineering's degree internship will be to study current hypotheses of neural signal generation and transmission across neural networks as a result of FUS stimulation. More details here.

3-5 recent publications:

1. Vion-Bailly et al. A causal study of the phenomenon of ultrasound neurostimulation applied to an *in vivo* invertebrate nervous model. *Scientific Reports*. 2019, *9*(1): 1-12. https://doi-org.docelec.univ-lyon1.fr/10.1038/s41598-019-50147-7
2. Suarez-Castellanos et al. Spatiotemporal characterization of causal electrophysiological activity stimulated by single pulse Focused Ultrasound: an ex vivo study on hippocampal brain slices. *Journal of Neural Engineering*. 2021. 18(2), 026022. https://doi-org.docelec.univ-lyon1.fr/10.1088/1741-2552/abdfb1
3. Aubier et al. Mixed Focused UltraSound (FUS) / fluorescence imaging platform for characterization of the spatial-temporal dynamics of FUS-evoked calcium fluxes in an in-vitro human cell model. *Proceedings of the IEEE IUS International Symposium*, p1-4. Virtual Meeting. 11-16 Sept. 2021 (poster). DOI : 10.1109/IUS52206.2021.9593676
4. Vion-Bailly et al. *Neurostimulation success rate of repetitive-pulse focused ultrasound in an in vivo giant axon model: An acoustic parametric study. Medical Physics.* 2022, 49(1), 682-701. https://doi-org.docelec.univ-lyon1.fr/10.1002/mp.15358
5. N'Djin et al. Causal neurostimulation by focused ultrasound: down to the effect of a single-pulse. *Brain Stimulation Symposium, Lisbon, Portugal, Feb. 19-22, 2023. Brain Stimulation: Basic, Translational, and Clinical Research in Neuromodulation*, 2023. *16*(1), 152-153. http://dx.doi.org/10.1016/j.brs.2023.01.117