

MASTER 2 Neurosciences Fondamentales et Cliniques

Internship proposal 2021-2022

(internship from January to end of May 2022)

Host laboratory: Institut des Sciences Cognitives, UMR 5229 CNRS/UCBL, 67 Bd Pinel, 69675 Bron, France

Website: <http://isc.cnrs.fr>

Host team : Decision, Action, and Neural Computation (DANC) team

Website: <https://www.danclab.com/>

Internship supervisors :

James Bonaiuto, Chargé de recherche

University / Institution: CNRS/ University Lyon 1

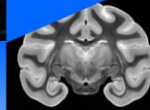
E-mail address : james.bonaiuto@isc.cnrs.fr

Project title : Functional role of cortical beta activity in naturalistic actions

Project summary :

Each of us performs thousands of motor actions during the course of daily tasks, ranging from relatively simple (e.g. clicking on a mouse button), to highly complex (e.g. holding a sheet of paper in one hand while using scissors to cut it in a straight line with the other). It is well established that the primary motor cortex is directly and intimately involved in many of these mechanisms, and it is often viewed as the primary 'output' region of the neocortex. Motor cortical activity in the beta frequency range (13-30Hz) is a hallmark signature of healthy and pathological movement, but its behavioral relevance remains unclear. This project will determine the functional role of beta bursts in naturalistic behavior by using magnetoencephalography (MEG) and electroencephalography (EEG) to study beta activity in adult human subjects performing reaching and grasping movements. This will be combined with deep learning neural networks for reconstructing the three-dimensional kinematics of the hand from multiple video cameras. The results of this project are expected to provide a foundational understanding of the mechanisms linking beta activity to behavior, laying the groundwork for targeted treatments for diseases of movement which are associated with pathophysiological beta activity, including Parkinson's.

Please send your proposal to emiliano.macaluso@univ-lyon1.fr and marion.richard@univ-lyon1.fr for publication on the Master of Neuroscience website.

**3-5 recent publications :**

Bonaiuto JJ, Little SJ, Neymotin SA, Jones SR, Barnes GR, Bestmann S. (under review) Laminar dynamics of beta bursts in human motor cortex. bioRxiv doi:

<https://www.biorxiv.org/content/10.1101/2021.02.16.431412v1>.

Bunday KL, Bonaiuto JJ, Betti S, Lemon RN, Orban G, Davare M. (under review) Mapping connectivity between the premotor cortex and contralateral primary motor cortex. bioRxiv doi: <https://doi.org/10.1101/743351>.

Bonaiuto JJ, Afdideh F, Ferez M, Wagstyl K, Mattout J, Bonnefond M, Barnes GR, Bestmann S. (2020) Estimates of cortical column orientation improve MEG source inversion. bioRxiv doi: <https://doi.org/10.1101/810267/>, *NeuroImage*, 26(1): 116862.

Little S, Bonaiuto J, Barnes G, Bestmann S. (2019) Human motor cortical beta bursts relate to movement planning and response errors. bioRxiv doi: <https://doi.org/10.1101/384370>, *PLoS Biology*, 17(10): e3000479

Bonaiuto JJ, Meyer SS, Little SJ, Rossiter HE, Callaghan MF, Dick F, Barnes GR, Bestmann S (2018) Lamina-specific cortical dynamics in human visual and sensorimotor cortices. bioRxiv doi: <https://doi.org/10.1101/226274>, *eLife*, e33977.