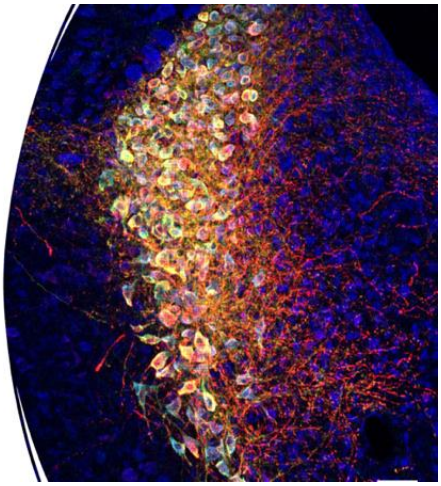
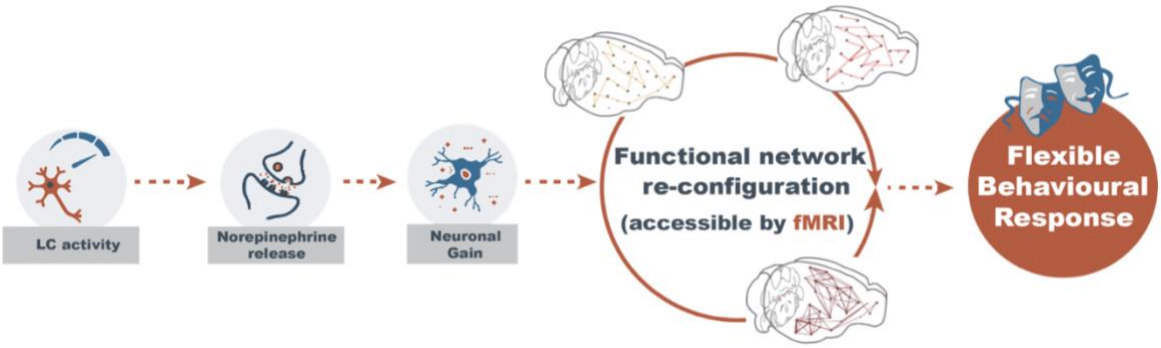
The **Zerbi Lab** at **EPFL** (School of Engineering, Institute of Bioengineering and Neuro-X) focuses on studying the mechanisms that link cellular activity to large-scale network (dys)function. Applications are invited for the following opening:

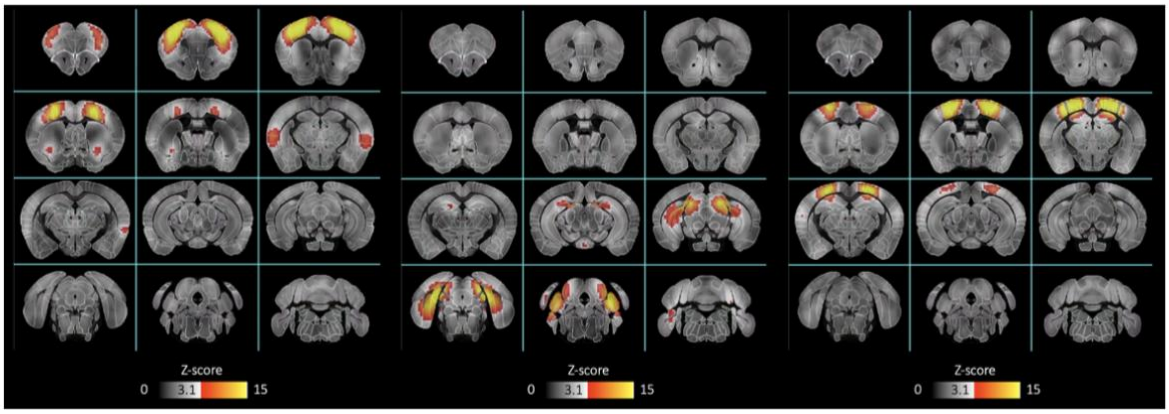
2 PhD Positions on the SNSF-funded Eccellenza project 'Blue Networks. How the Locus Coeruleus controls and reorganizes brain activity'



Background: The Locus Coeruleus (LC) is a small nucleus of the brain stem that synthesizes and distributes norepinephrine (NE) throughout the brain, and can influence many brain functions, from attention to sensory processing, from sleep / wake cycles to response to stress. However, how such a small structure can influence so many distinct processes is unknown. To date, numerous studies have given way to the realization that the LC activity modes, the distribution of NE receptors and the anatomical organization of LC neurons are the key determinants for facilitating distinct behavioural processes. What remains unknown – and what we will set out to study in this project – is how LC activity causally and selectively regulate the function of target brain areas and networks.

Project Description: This project uses an experimental and computational approach to shed light on how LC can modify the internal state of the brain and how this affects the perception of the external world. Experimentally, we will use a mix of optogenetic manipulations, fiber photometry, pupillometry, sensory stimulations and functional MRI in rodents. This will allow us to understand how different firing patterns of the LC can mobilize distinct brain networks and modify the internal processing of sensory stimuli. Computationally, we will integrate these experimental data into neural-mass models that are calibrated to rodent data and able to simulate the microcircuit mechanisms through which the LC/NE system regulates network dynamics, thus mechanistically explaining our interventions.





Location: This PhD position will be placed in the translational, multidisciplinary, collaborative, and international environment of EPFL. Candidates will be hosted at the CIBM Centre for Biomedical Imaging (www.CIBM.ch) in Lausanne.

Requirements: The successful candidate should have a MSc degree in the fields of neurobiology, neuroscience, biomedical engineering, physics, or a related field. Candidates must be highly motivated to perform innovative multi-modal neuroimaging studies and be able to work with animal models (FELASA C, LTK-1 or equivalent). The ideal candidate will have solid theoretical knowledge and practical experience with optogenetics and/or Ca+ imaging methods for PhD position#1, and a strong background in MR imaging processing and network neuroscience for PhD position#2. S/he is a team player, enjoys interdisciplinary work, has strong communication skills, has scientific curiosity, and performs rigorous experimental work. Fluency in English is essential.

Please note that we exclusively accept applications submitted through the EPFL doctoral schools' portal. The candidate must enrol in the EPFL PhD program in Neuroscience or Physics (EDNE, EDPY, next deadline Oct 31st 2022, https://www.epfl.ch/education/phd/edne-neuroscience/, https://www.epfl.ch/education/phd/edpy-physics/) to be hired for this position.

Before applying, please inquire about the position to Dr. Valerio Zerbi (valerio.zerbi@epfl.ch), specifying your motivation and which position you are interested in with a short cover letter and contact of two referees.

Key references

1. Optogenetic activation of striatal D1R and D2R cells differentially engages downstream connected areas beyond the basal ganglia. Grimm C, Frässle S, Steger C, von Ziegler L, Sturman O, Shemesh N, Peleg-Raibstein D, Burdakov D, Bohacek J, Stephan KE, Razansky D, Wenderoth N, Zerbi V. **Cell Reports**. 2021 Dec 28;37(13):110161.

2. Rapid Reconfiguration of the Functional Connectome after Chemogenetic Locus Coeruleus Activation. Zerbi V, Floriou-Servou A, Markicevic M, Vermeiren Y, Sturman O, Privitera M, von Ziegler L, Ferrari KD, Weber B, De Deyn PP, Wenderoth N, Bohacek J. **Neuron**. 2019 Aug 21;103(4):702-718.e5.

3. Extracting Dynamical Understanding From Neural-Mass Models of Mouse Cortex. Siu PH, Müller E, Zerbi V, Aquino K, Fulcher BD. **Front Comput Neurosci**. 2022 Apr 25;16:847336.