



Master of Science – Biomedical Engineering
Thesis Proposal

Role of the prefrontal cortex in auditory learning

Learning to recognize a sound confers an advantage to behave freely and safely in our environment. The auditory cortex processes the sounds we hear and associate them with their behavioral meanings. The process by which this sound-behavior association is acquired is called auditory associative learning. The neuronal circuit allowing such association is, however, not yet understood.

We are currently investigating this process with the goal of unravelling the role inhibitory neurons play in such auditory learning. We previously showed that inhibitory neurons from the auditory cortex needs to be downregulated to allow auditory learning. Our hypothesis is that, throughout the training process, feedback inputs from prefrontal brain areas to the auditory cortex are reinforced to allow the expression of the learned stimulus. Indeed, prefrontal areas are coding for valence of sensory cues and goal-directed behaviors. The aim of this master thesis project is to test this hypothesis. To this aim, the student will train mice to a behavioural sound discrimination task and use chronic in vivo electrophysiology and optogenetics to record and manipulate the prefrontal cortex to investigate learning-related plastic changes at the functional level. The student will use programming to process electrophysiological data using spike sorting algorithms. Using matlab and/or python, she/he will then analyse these data in order to decipher changes of neuronal activity correlated with behavioural performance.

Nature of the Thesis

Experimental: 50%

Programming: 40%

Documentation: 10%

Specific Requirements

Experience with Matlab would be useful

Group Leader / Supervisor

Group Leader: Prof. Tania Rinaldi Barkat, University of Basel, Department of Biomedicine,

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