Duration of stay: 24th of January – 24th of April, 2017

Home institution:

Prof. Michaela Kress, Division of Physiology, Department of Physiology and Medical Physics, Medical University of Innsbruck, Austria

Host institution:

Prof. Huibert Mansvelder, Department of Integrative Neurophysiology, CNCR, VU University, Amsterdam, The Netherlands

Getting a NENS Grant Stipend provided me with an opportunity to visit the lab of Prof. Huibert Mansvelder at the CNCR, Amsterdam for 3 months. I have chosen the Mansvelder Lab because of their proven expertise and excellence in investigating cholinergic cortical processing, as well as combining electrophysiological recordings and imaging from single neurons and networks of neurons with optical stimulation.

The time spent in the lab I used to learn the Whole Cell Patch-Clamp technique in brain slices, a method in electrophysiology widely used to study electrical properties of neurons. By patching neurons in coronal slices of the prefrontal cortex (PFC) as well as basal forebrain nuclei (BF), I was able to investigate the passive and active biophysical properties of excitable cells in those regions. In addition, by means of specific manipulations (pharmacological, electrical and optogenetic) I was able to isolate specific neuronal responses in real-time.

Particular attention I dedicated to identifying different muscarinic and nicotinic types of cholinergic responses elicited by endogenous acetylcholine (ACh) release by terminals of cholinergic neurons in the PFC using optogenetics. For this purpose, I introduced a microbial opsin gene, channelrhodopsin (ChR), a cation channel pore opened by 473 nm light illumination, in the targeted neuronal population, cholinergic neurons. I employed two approaches to selectively express ChR2 in cholinergic neurons: 1) stereotaxic injection of a floxed viral vector into the basal forebrain of ChAT-Cre mice and 2) crossing ChAT-Cre and floxed ChR2 mouse lines, already available in the lab.

Apart from successfully characterizing different types of muscarinic and nicotinic responses to endogenous ACh release in different cell types, particularly layer V pyramidal cells of the PFC, I would identify a cell type according to their action potential firing patter and profile as well as morphological characteristics following imaging of biocytin filled cells.

6th of June, 2017

As a guest PhD student I was actively supervised through all the steps of my training and was able to get useful inputs regarding my PhD project. Moreover, I will use this technique to investigate changes in cholinergic processing in the prefrontal cortex of neuropathic mice.

Finally, my stay in Amsterdam provided me with the skills and the knowledge to independently implement the learned techniques which were not available in my home lab. For 3 months I was a part of an inspiring and diverse scientific environment, with an opportunity to form new connections within the neuroscience community that might lead to future collaborations as well as many friendly discussions at the next FENS meeting.

Therefore, I would like to thank the FENS Committee of Higher Education and Training for the provided support and am happy to inform that the goals of my training were achieved.

6th of June, 2017