RUHR-UNIVERSITÄT BOCHUM

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IGSN - SYMPOSIUM

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Principles of Brain Wiring

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Excitatory neuronal networks in the rodent somatosensory cortex: what morphology of a neuron has to do with its function

The primary somatosensory (barrel) cortex of rodents is an ideal model system to study how in the cortex specific morphological neuron classes bind together functional modules and how intra- and transcolumnar microcircuits are laid out to segregate as well as integrate sensory information. In the barrel cortex each of the different excitatory neuron classes shows complex and unique cell type-specific intracortical functional connectivity patterns. These patterns can be experimentally revealed e.g. via a combination of in vitro whole cell patch clamp, multi-site photolytic release of glutamate (focal caged glutamate photolysis) and single cell morphometry *(Staiger et al., 2014; for review see Schubert et al., 2007).*

During this lecture I will illustrate that excitatory neurons show a layer-specific connectivity pattern on top of which further cell type-specific circuits can be distinguished. The resulting multiple sequential and parallel circuits are likely to be suitable for cortical processing of spatial and temporal aspects of tactile information acquired by the whiskers on the snout. Apart from these fundamental aspects the well described topological organization of the barrel cortex allows for investigating the consequences of distorted brain development on cortical network structure and function. I will demonstrate how relatively mild distortions during brain development can lead to a chain of morphological changes in the previously described cellular networks which eventually affect sensory perception of the animals.

Schubert D, Kötter R, Staiger JF (2007). Mapping functional connectivity in barrel-related columns reveals layer- and cell type-specific microcircuits; Brain Struc. Funct.

Miceli S, Negwer M, van Eijs F, Kalkhoven C, van Lierop I, Homberg J, Schubert D (2013). High serotonin levels during brain development alter the structural input-output connectivity of neural networks in the rat somatosensory layer IV. Front Cell Neurosci

Staiger JF, Bojak I, Miceli S, Schubert D. (2014) A gradual depth-dependent change in connectivity features of supragranular pyramidal cells in rat barrel cortex. Brain Struct Funct

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