



Universität
Basel

Research Project

NeuroVision - The organisation of functional microcircuits in visual cortex

Third-party funded project

Project title NeuroVision - The organisation of functional microcircuits in visual cortex

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Organisation / Research unit

Departement Biozentrum / Neural Networks (Mrsic-Flogel)

Department

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Status Completed

Determining how the organisation of neural circuitry gives rise to its function is a major challenge for understanding the neural basis of perception and behaviour. In order to determine how different regions of the neocortex process sensory information, it is necessary to understand how the pattern and properties of synaptic connections in a specific sensory circuit determine the computations it performs. I propose to establish the relationship between synaptic connectivity and neuronal function in primary visual cortex (V1) with the aim of revealing circuit-level mechanisms of sensory processing. To this end, my laboratory has developed a new method, by which visual response properties of neurons are first characterised with two-photon calcium imaging in vivo, and then synaptic connections between a subset of these neurons are assayed with multiple whole-cell recordings in slices of the same tissue. We will use this method to determine how connectivity, synaptic and intrinsic properties of different excitatory and inhibitory cell types relate to the emergence of their visual receptive fields (RFs). Specifically, we will test the dependence of connections on RF position and structure, the specificity of connections between simple and complex cells, and the relative contribution of feedforward and recurrent excitation and inhibition towards shaping RFs. Morphological, physiological, connectional and functional data will be used to develop a biophysically realistic network model of this V1 circuit to examine the contribution of different circuit components to single-neuron and network function.

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