Neuroscience Colloquium

Winter-Semester 2019/2020

Lectures are held Thursdays, 5 p.m.
Venue: Paul-Ehrlich Lecturehall, Virchowweg 4, next to CCO

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A confederation of independent mini-neurons: From local to global signalling in olfactory bulb granule cell dendrites

The vertebrate olfactory bulb processes olfactory stimuli within a two-stage network, with the stage first located in the glomerular input layer and the second in the external plexiform layer below. These subnetworks are bridged via the principal mitral and tufted cells; both strongly draw on dendrodendritic interactions, with the axonless inhibitory granule cells being the main players in the second stage. Granule cells direct their sole output towards the long lateral dendrites of mitral and tufted cells via reciprocal dendrodendritic synapses that are located within large spines.

In spite or because of their apparently reduced anatomy, granule cells are capable of various modes of dendritic signalling. To dissect the reciprocal interactions, we are using two-photon Ca^{2+} imaging and uncaging of glutamate in acute slices of juvenile rat olfactory bulbs in conjunction with whole cell recordings and compartmental modeling. Our observations indicate that single inputs to the granule cell spine elicit a purely local sodium spike, which then engenders release of GABA. Thus the reciprocal spine functions as a mini-neuron that can provide recurrent inhibition independently of its 'mother neuron'. Surprisingly, presynaptic NMDA receptors also play an essential role for GABA release from the spine. Finally, holographic multi-site photostimulation now allows us to investigate the role of active conductances during dendritic integration. We find that rather low numbers of co-activated spines can trigger global spikes in GCs and thus lateral inhibition across principal neurons.

Location: Paul Ehrlich-Hörsaal,
Charité – Universitätsmedizin Berlin, Campus Mitte
Virchowweg 4, next to CCO

Date: Thursday, **October 31st, 5 p.m.**

Host: Ursula Koch

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