Introductory Remarks to Symposium 1

Common principles of spatial and temporal sensory processing

Carlotta Martelli, Marion Silies and Jan Clemens, Konstanz, Mainz and Göttingen

In the outside world (or in a conference room), our sensory organs are exposed to different sensory cues that change in space and time. All animals rely on the efficient processing of this sensory information to make behavioral decisions. The transformations that take place within the underlying neural circuits must be precise and flexible at the same time, and can therefore be complex. This is not only true in our brain, but also in the smaller brains of invertebrates that we use as models to address basic questions of sensory processing. Such organisms allow us to study in detail the neural circuits and computations involved in sensing and to link input stimuli to behavioral outputs.

The behavior of an animal is often tuned to specific temporal or spatial features of sensory cues. This is true in different sensory contexts: minimal changes in odor concentration can for example attract a flying *Drosophila* to an odor source, female flies or crickets are sensitive to specific temporal structures in the song of a mating partner, and visual cues can be interpreted precisely over space and time to help the fly navigate its environment.

Although olfaction, audition and vision mediate very different tasks, the underlying neural computations often turn out to involve similar mechanisms. For example, all three sensory pathways need to adapt on multiple time scales in order to maintain responsiveness to the stimulus and optimally encode its properties. Moreover, all three sensory modalities make use of local inhibition to scale the response of single neurons by the summed activity of the population, a computation called divisive normalization. Across modalities, inhibition and excitation interact in a precisely timed manner to allow the extraction of spatial and/or temporal patterns.

We believe that further insight in sensory processing can be boosted by the exchange between communities of scientists working in different sensory modalities. In this symposium we will discuss recent advances in the understanding of the neural mechanisms for the encoding of temporal and spatial patterns in olfaction, mechanosensation, audition and vision in model and non-model insects. By bringing together speakers working on different modalities, we will highlight common principles of sensory computation.

Symposium 1

Wednesday, March 20, 2019
14:30 - 16:30, Lecture Hall 8

Chairs: *Carlotta Martelli, Marion Silies and Jan Clemens, Konstanz, Mainz and Göttingen*

14:30 Carlotta Martelli, Konstanz
ADAPTIVE RESPONSES AND POPULATION DYNAMICS IN THE OLFACTORY SYSTEM OF *DROSOPHILA* (S1-1)

14:55 Barani Raman, Saint Louis, USA
A COMPUTATIONAL LOGIC FOR OLFACTION (S1-2)

15:20 Alexander Chockley, Cologne
SUBGROUPS OF FEMORAL CHORDOTONAL ORGAN NEURONS DIFFERENTIALLY AFFECT LEG MOVEMENTS AND COORDINATION IN *DROSOPHILA MELANOGASTER* (S1-3)

15:30 Berthold Hedwig, Cambridge, UK
UNRAVELING A DELAY-LINE AND COINCIDENCE DETECTOR CIRCUIT FOR AUDITORY PATTERN RECOGNITION (S1-4)

15:55 Katja Sporar, Göttingen
CELLULAR AND CIRCUIT MECHANISMS THAT SEPARATE LUMINANCE AND CONTRAST SENSITIVITY IN PERIPHERAL VISUAL PROCESSING (S1-5)

16:05 Karin Nordstrom, Adelaide, Australia
HOVERFLY VISION IN NATURALISTIC SURROUNDS (S1-6)