Neural circuits underlying olfactory coding in the *Drosophila* antennal lobe

Yoichi Seki, Jürgen Rybak, Dieter Wicher, Silke Sachse, and Bill S. Hansson
Max Planck Institute for Chemical Ecology, Department of Evolutionary Neuroethology, Germany.

Powerful genetic tools and recent advancements in physiological recording techniques have made *Drosophila melanogaster* a unique model to understand brain functions, from single neurons to circuits directly underpinning behavior. Our study aims at understanding olfactory coding mechanisms in the *Drosophila* antennal lobe (AL), where olfactory sensory neurons converge onto glomerular structures and form synapses with local interneurons (LNs) and projection neurons (PNs). First, to reveal local building blocks of the AL circuitry, we performed a detailed characterization of LNs using *in situ* whole-cell patch-clamp recordings. We could reveal a diversity of LN classes based both on intrinsic electrophysiological properties and morphology. This result provides a basis for further examinations of olfactory coding mechanisms. Second, to understand how odors are processed through the AL circuits, we proceed to map odor response profiles of PNs using *in vivo* whole-cell patch-clamp recordings. PN response profiles are compared with those of sensory neurons and both dendritic and axonal arborizations are analyzed. This work provides insight into how odor information is transformed through processing in the AL circuitry and is then translated for higher brain centers. Our final aim is to understand how AL processing allows the highly specific odor-directed behavior displayed by these flies.