

## Delwart Contributed Symposium - Higher olfactory processing Tuesday 26 June

### Deconstructing odor representations in the mushroom body

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In the sensory environment of *Drosophila*, most odors do not carry an a priori meaning. Rather, they can elicit appetitive or aversive behaviors depending on the context in which they were first perceived. It is currently unclear how neural circuits are organized to allow for such context-dependent associations. At the peripheral level, the *Drosophila* olfactory circuit is a highly stereotypical map: neurons expressing a given odorant receptor converge into a common glomerulus in the antennal lobe. How the olfactory circuit is organized at the next processing level, the mushroom body, a brain center required for learning and the formation of associative memories, is not known. Here, we characterize the connections between Kenyon cells, the major cell type in the mushroom body, and the projection neurons that innervate individual glomeruli. We combine neural tracing using a photoactivable green fluorescent protein (PA-GFP) with single-cell dye-injection to determine the number and identity of projection neurons connected to individual Kenyon cells. We find that Kenyon cells are connected randomly to the antennal lobe: Kenyon cells sample widely across glomeruli and integrate input from different sensory modalities. This coding strategy is in contrast to the stereotypical map seen at the periphery and is well suited for context-dependent associations as it represents sensory information without an a priori bias.

#### Poster session I Poster #85

### Electrophysiological and behavioural responses of the Grapevine Moth to odours of *Perilla frutescens*

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The Grapevine Moth *Lobesia botrana* is a major pest of grapes worldwide and its control still largely relies on insecticide applications. There is accordingly great interest in identifying attractant or repellent semiochemicals interfering efficiently with both male and female olfaction, in order to develop alternative control strategies.

Host plant volatiles playing a relevant role in the plant selection process of this insect have been extensively studied but their effectiveness for control purposes is strongly negatively affected by the overlapping background odour in the vineyard. Finding of behaviourally active compounds emitted by non-host plants would represent an attractive target for the *L. botrana* control. Therefore, we studied the biological activity on *L. botrana* olfactory system of secondary metabolites isolated from the Asian food plant *Perilla frutescens* (L.). Interestingly, *Perilla* compounds were shown to activate a novel family of receptor, the Transient Receptor Potential (TRP) channels, expressed also in the antennae of lepidopterous species.

The olfactory response of *L. botrana* females to *Perilla* extracts was preliminary tested adopting electroantennographic experiments (EAG). Antennal-active compounds were identified by a gas chromatograph equipped with a mass spectrometer (GC-MS). Moreover, gas-chromatography coupled with electroantennography (GC-EAD) allowed to detect several active compounds eliciting significant electrophysiological responses on female antennae. In a dual choice oviposition test based on olfactory cues, females showed a dose-dependent preference for the odours released by *Perilla* even in presence of the odour bouquet of the host plants.

Future molecular, physiological and behavioural studies will focus on the activity of the single and blended *Perilla* compounds and on the role of TRP receptors in their perception with the aim to improve the current strategies for the management of pest populations.