Mosquito brains encode unique features of human odour to drive host seeking. Zhao et al., (2022) Nature. May 605(7911):706-712. Article

Re-interpretation in terms of the IPL mechanism

Human odor stimulus leads to activation of a specific glomerulus in Aedes mosquitos. Every glomerulus receives more than on sensory neuronal input. For example, in Drosophila melanogaster a single glomerulus that senses CO_2 has more than one sensory neuron arriving to that glomerulus (Jones et al., 2007). Close examination of the findings in a recent work (Zhao et al., 2022) shows that more than one sensory neuron is necessary for a specific sensory perception to occur. It is known that neurons that express the same complement of ligand-specific receptors send axons to a single olfactory glomerulus (Vosshall & Stocker, 2007). Hence, it is generally thought that glomerulus is an ideal location to study sensory perception (Wang et al., 2003; Semmelhack & Wang, 2009).

Since more than one sensory neuron (olfactory neuron) is needed for perception to occur, it is reasonable to assume the presence of an interactive change occurring between these neurons or their immediate output neurons. This matches with the previous explanation for the generation of first-person property of perception by the semblance hypothesis (Fig.1; Vadakkan, 2015).

Based on the semblance hypothesis, units of internal sensation of perception namely perceptons are generated at the locations where two sensory inputs converge (Vadakkan, 2015). But the question is how does the fly recognize human odor for the first time as something beneficial? Generation of the first-person property of internal sensation concurrent with motor actions to fly towards humans during first instance is most likely to occur automatically by virtue of an inherited wiring mechanism. Hence, the first instance of flight towards a human most likely occurs as expected from an automaton. This and future events of flights towards humans can lead to associations between sensory inputs taste of the blood or filling of stomach or satiety can lead to formation of IPLs that can generate both internal sensations

necessary for survival concurrent with appropriate motor actions. Hence, during later times, this becomes a learned behavior.

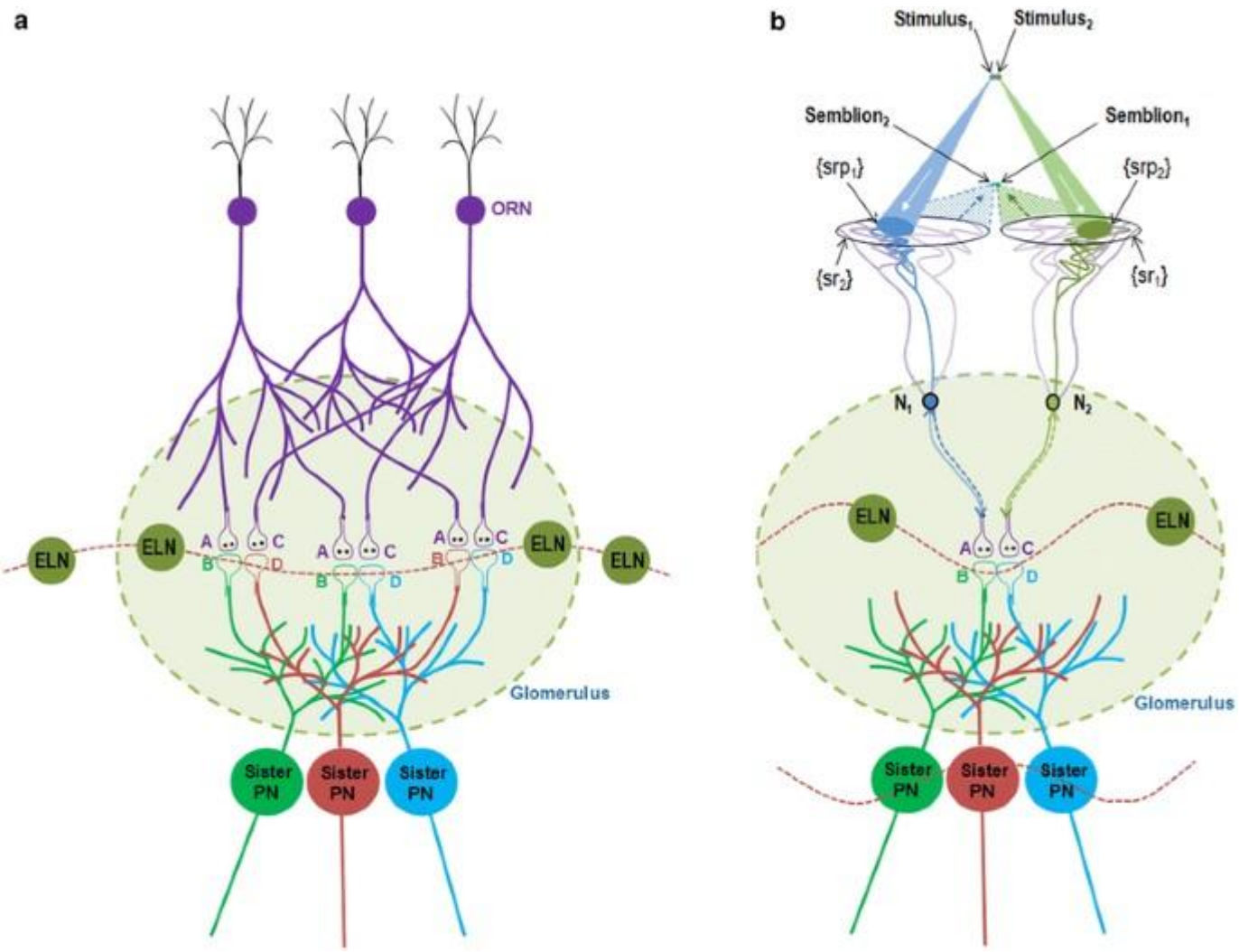

Figure 1. Schematic diagram showing the mechanism of olfactory percept formation within a glomerulus. a) Spread of activity through the neuronal processes in the absence of odorants. The baseline firing of the olfactory receptor neurons (ORNs) leads to spread of activity to the synapses between the ORNs and the projection neurons (PNs). Spread of activity through the excitatory local neurons (ELNs) from one glomerulus to other glomeruli results in oscillating activity across different glomeruli in the antennal lobe. Two postsynaptic terminals each from the corresponding three different sister PNs whose dendrites are located within a single glomerulus are shown. Based on the present work, existing inter-postsynaptic LINKs within each of the different glomeruli can contribute to horizontal component that can

trigger oscillations of potentials among the glomeruli. The integral of all the non-specific semblances induced at the inter-postsynaptic LINKs is called C-semblance that can contribute to the attention of the fly. A and C are the presynaptic terminals of the ORNs. B and D are the postsynaptic terminals (dendritic spines) of two different PNs within a glomerulus. b) Induction of perceptons in the presence of an odorant. Two synapses between two ORNs and two sister PNs within the glomerulus along with their interpostsynaptic LINK (IPL) B–D is shown. In the context of background C-semblance, the stimulus-semblion U-loops form at the inter-postsynaptic LINK B–D to induce perceptons. Note that the semblions are shown to overlap closer to the olfactory receptors than the actual source of the odorant. This enables localization of the odor close to the olfactory receptors, in contrast to the visual perception. The entanglement of perceptons provides the conformation for the percept of a specific smell. Percept of a specific attractive smell formed within a glomerulus can trigger motor actions to the fly along the concentration gradient as a response to increasing percepts, the fly can reach towards the source of food. Note that the oscillating potential wave form that extend beyond the single glomerulus in the absence of odorants gets limited to that glomerulus alone due to the spread of inhibitory activity to the other glomeruli through the inhibitory local neurons (ILNs) during perception (Figure from Vadakkan, 2015).

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