Control of sugar and amino acid feeding via taste integration of distinct pharyngeal taste neurons

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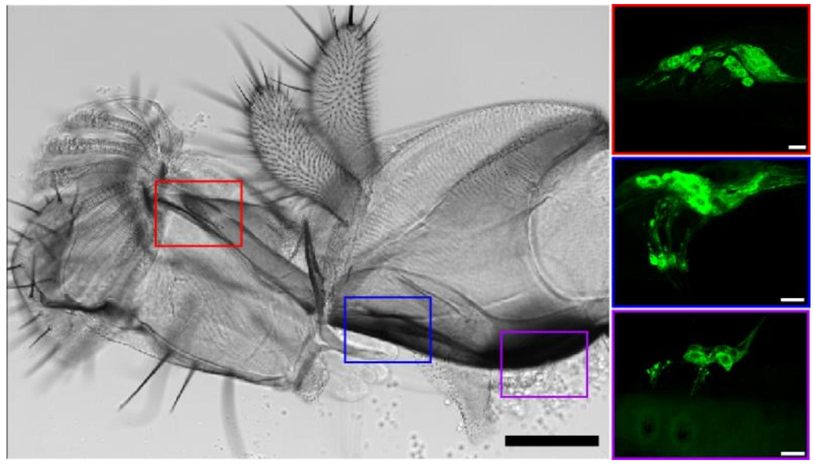
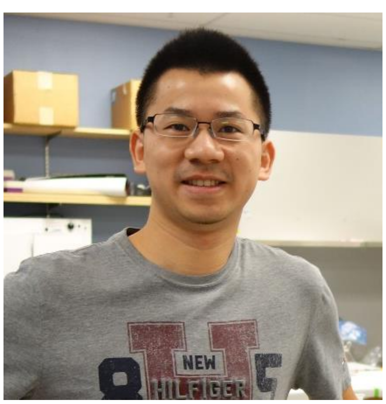


Gustatory inputs play instrumental roles in feeding behavior, including food choice and intake. In adult *Drosophila*, the gustatory systems comprise of multiple taste organs throughout the body, including external ones in the labellum, legs, wings and internal ones in the pharynx. The gustatory receptor neurons (GRNs) in each taste sensillum on the taste organs express distinct chemosensory receptors for detecting various chemicals in food substrates. To understand neuronal underpinning of taste-mediated feeding control, it is critical to determine how responses elicited by distinct functional classes of GRNs are translated into different feeding behaviors. Recent studies have described sensory response profiles of GRNs to various sugars and amino acids; however, how individual taste neurons in each taste organs contribute to feeding control remain poorly defined. Here, we use *Drosophila* pharynx as a model to investigate the extent to which taste information is integrated at the cellular level and regulate consumption of sugars and amino acids. We generate taste-blind animals and examine the effects of functional restoration of single classes of taste neurons in the adult *Drosophila* pharynx. We report that pharyngeal Gr43a neurons integrate information about sweet and amino acids tastants. Genetic dissection experiments uncover another functional redundant pharyngeal Ir20a neurons in detecting amino acids. Optogenetic activation of sweet taste neurons reveal functional specializations between external and internal taste neurons. Finally, high-resolution behavioral analyses reveal tastant-specific coordination of pharyngeal GRNs in regulating micro-feeding responses to sugars and amino acids. Overall, we identify previously unexplored appetitive taste coding principles in pharynx and provide evidence of functional overlap and subdivision among taste neurons.



Speaker Bio:
Yu-Chieh (David) is trained as a sensory neurobiologist with a broad research interest in the fundamental processes underlying primary senses: vision, touch, hearing, and chemosensation (taste and smell), which are essential for organisms to perceive and interact with the world. He obtained his graduate degree at UC Riverside under the guidance of Dr. Anupama Dahanukar. His doctoral research has mainly focused on how internal pharyngeal taste neurons mediate insect feeding behaviors by using *Drosophila* as a model organism. He is currently a postdoc in the same lab and will join Dr. Claude Desplan's lab at NYU for further postdoctoral training in 2020.

Topic areas: Cellular Genetics, Complex Traits, Developmental & Behavioral Genetics, Gene Expression, Genome Integrity & Transmission, Genome & Systems Biology, Methods, Technology, & Resources, Statistical Genetics & Genomics, Empirical or Theoretical Population Genetics, Computational Biology & Bioinformatics, Genetics of Disease, Molecular & Cellular Genetics, Population & Evolutionary Genetics.