Duke Fly Club informal event

March 28th, Tuesday, 2023 4:15 pm | Bio Sci 144

Wiring up the brain during development: coordination and propagation of cell fate choice in neural circuit assembly

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How vast numbers of neurons are specified into correct cell fates and connected with their proper targets during development represents a fascinating area of developmental neuroscience. Little is known about the coordination between neuronal specification and specific connectivity patterns, especially when two synaptic partners undergo two different modes of cell specification (stochastic vs. deterministic). In the fly retina, pale (**p**) and yellow (**y**) subtypes of color photoreceptors (R7 and R8) are stochastically specified, whereas their synaptic partners in the optic lobe are produced through highly deterministic programs. How do stochastically determined **p** vs. **y** R7 and R8 find their respective targets that are deterministically specified in the optic lobes?

Previous work from our lab identified one pair of Dprs and DIPs, members of an interacting network of immunoglobulin superfamily proteins, is important for the synaptic connection between yR7 and its downstream target. I therefore hypothesize that different pairs of cell adhesion molecules can mediate the matching of other synaptic partners. By using advanced single-cell RNA sequencing technology, CRISPR gene editing, and sophisticated genetic manipulation in the *Drosophila* color vision circuit, I aim to identify cell adhesion molecules that direct synaptic partner matching and the molecular logic for coordinating between cell-type specification and the synaptic connectivity at the system level. I will be presenting our functional analyses of these candidate molecules in regulating synaptic partner matching. Overall, our work has uncovered novel molecular mechanisms regulating synaptic pairing and probes the fundamental principles underlying the propagation of stochastic cell fate choices during circuit assembly.