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Optogenetic Circuit Mapping In Drosophila Larvae

Understanding how neural circuits process and transform sensory information to produce behavioral responses has been an ongoing endeavor in the field of neuroscience. Using optogenetic and circuit mapping technology, our research has aimed to map the fly larval mechanosensory and thermosensory neural circuits. Drosophila larva was used because of its outstanding molecular genetic toolbox, relatively simple nervous system, and nearly transparent body. The initial goal of our research was to spatially restrict the expression of transgenes to one or a small number of segments in the larva to make the responses to optogenetic stimulation as natural as possible. By trying to use regulatory regions from the homeotic gene AbdA and by examining existing lines of flies using regulatory regions from the other homeotic genes Ubx and AbdB, our lab has been experimenting on determining transgenes that will express in a small segment of the ventral nerve cord in the abdominal region. Overall, by seeking to map Drosophila mechanosensory and thermosensory circuits, an insight into neural circuitry analysis of more advanced organisms, where this degree of manipulation and understanding is not possible at this time, will be gained.