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Mathematical Relationships between Neuron Morphology and Neurite Growth Dynamics in *Drosophila melanogaster* Larva Class IV Sensory Neurons SUJOY GANGULY, Yale Univ, XIN LIANG, Tsinghua University, MICHAEL GRACE, DANIEL LEE, JONATHON HOWARD, Yale Univ — The morphology of neurons is diverse and reflects the diversity of neuronal functions, yet the principles that govern neuronal morphogenesis are unclear. In an effort to better understand neuronal morphogenesis we will be focusing on the development of the dendrites of class IV sensory neuron in *Drosophila melanogaster*. In particular we attempt to determine how the the total length, and the number of branches of dendrites are mathematically related to the dynamics of neurite growth and branching. By imaging class IV neurons during early embryogenesis we are able to measure the change in neurite length $l(t)$ as a function of time $v(t) = dl/dt$. We found that the distribution of $v(t)$ is well characterized by a hyperbolic secant distribution, and that the addition of new branches per unit time is well described by a Poisson process. Combining these measurements with the assumption that branching occurs with equal probability anywhere along the dendrite we were able to construct a mathematical model that provides reasonable agreement with the observed number of branches, and total length of the dendrites of the class IV sensory neuron.

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