

# 2018 Wellnitz Prize for a paper by a GGD student: Amy Poe

## Dendritic space-filling requires a neuronal type-specific extracellular permissive signal in *Drosophila*

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Neurons sometimes completely fill available space in their receptive fields with evenly spaced dendrites to uniformly sample sensory or synaptic information. The mechanisms that enable neurons to sense and innervate all space in their target tissues are poorly understood. Using *Drosophila* somatosensory neurons as a model, we show that heparan sulfate proteoglycans (HSPGs) Dally and Syndecan on the surface of epidermal cells act as local permissive signals for the dendritic growth and maintenance of space-filling nociceptive C4da neurons, allowing them to innervate the entire skin. Using long-term time-lapse imaging with intact *Drosophila* larvae, we found that dendrites grow into HSPG-deficient areas but fail to stay there. HSPGs are necessary to stabilize microtubules in newly formed high-order dendrites. In contrast to C4da neurons, non-space-filling sensory neurons that develop in the same microenvironment do not rely on HSPGs for their dendritic growth. Furthermore, HSPGs do not act by transporting extracellular diffusible ligands or require leukocyte antigen-related (Lar), a receptor protein tyrosine phosphatase (RPTP) and the only known *Drosophila* HSPG receptor, for promoting dendritic growth of space-filling neurons. Interestingly, another RPTP, Ptp69D, promotes dendritic growth of C4da neurons in parallel to HSPGs. Together, our data reveal an HSPG-dependent pathway that specifically allows dendrites of space-filling neurons to innervate all target tissues in *Drosophila*.

