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How Synapses Form and Function

The computational power of the brain depends on synaptic connections that link together billions of neurons. The focus of my laboratory's work is to understand the mechanisms by which neurons form synaptic connections, how synapses transmit information, and how synapses change during learning and memory. To complement this basic research in neuroscience, we also study how alterations in neuronal signaling underlie several neurological diseases, including epilepsy and Huntington ' s Disease. We combine molecular biology, protein biochemistry, electrophysiology, and imaging approaches with *Drosophila* genetics to address these questions. Moving beyond genomic data to determine how proteins specify the distinctive signaling properties of neurons and enable them to interconnect into computational circuits that dictate behavior are major goals for the next decade of neuroscience research. Despite the dramatic differences in complexity between *Drosophila* and humans, genomic analysis has confirmed that key neuronal proteins and the functional mechanisms they govern are remarkably similar. As such, we are attempting to elucidate the mechanisms underlying synapse formation, function and plasticity using *Drosophila* as a model system. By characterizing how neurons integrate synaptic signals and modulate synaptic growth and strength, we hope to bridge the gap between molecular components of the synapse and the physiological responses they mediate.

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Additional Publications

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