Abstract
Neuron-astrocyte interactions play a critical role in the regulation of synapse formation and circuit assembly. However, questions remain as to how astrocytes ‘know’ when and where to activate expression of synaptogenic factors. Our data suggests that neuron derived Sonic hedgehog may serve to coordinate the spatial temporal patterning of molecular programs in astrocytes to coordinate synapse assembly in specific layers of the cortex. We’ve shown that canonical Sonic hedgehog (Shh) pathway signaling in cortical astrocytes acts to coordinate layer-specific synaptic connectivity. We find that loss of Shh in layer V neurons reduces astrocyte complexity and coverage by astrocytic processes in tripartite synapses; conversely, cell-autonomous activation of Shh signaling in astrocytes promotes cortical excitatory synapse formation. Furthermore, Shh-dependent genes Lrig1 and Sparc distinctively contribute to astrocyte morphology and synapse formation. Shh signaling appears to regulate the molecular specialization of developing astrocytes throughout the brain. I will discuss our recent progress toward understanding how Shh signaling promotes the development and function of region-specific brain circuits.