

Farran Briggs, University of Rochester

*Corticogeniculate circuits in the visual system*

Corticothalamic circuits that connect primary sensory cortex with first order sensory thalamus are hallmarks of all sensory systems and are often the first feedback circuits in sensory processing hierarchies. Although these feedback circuits are ubiquitous across sensory systems and often anatomically robust, their function in sensory perception remains somewhat mysterious. We study these corticothalamic feedback circuits in the visual system where these circuits are termed “corticogeniculate” because they connect the visual cortex with the dorsal lateral geniculate nucleus of the thalamus. We show that corticogeniculate neurons are physiologically and morphologically diverse, suggesting parallel functioning in visual perception. Furthermore, we have demonstrated that corticogeniculate neurons are not restricted to primary visual cortex. Instead, we find evidence for morphologically distinct parallel streams of corticogeniculate feedback originating throughout extrastriate visual cortex. These findings suggest that corticothalamic connections to first order sensory thalamus are not restricted to primary sensory cortex, but instead form a network of feedback connections throughout the sensory processing hierarchy. Extrastriate corticogeniculate neurons are sparse, however, raising interesting questions about their unique, possibly parallel, functional roles in visual perception.

mammalian species, we revealed that the callosal inter-hemispheric connections are highly important for network balancing and regulation through evolution. This universal conservation law was also able to explain also inter-subject connectivity variability within species on the HCP connectome database. In the lecture, I will describe the rules of inter-hemispheric connections in brain plasticity and evolution and the universal connectivity conservation law.