

# Sponsored Research



**PI: Gordon Shepherd, MD, PhD,**  
associate professor of Physiology

**Sponsor: National Institute of  
Neurological Disorders and Stroke**

**Title: Synaptic Circuit Organization of  
Motor Cortex**

Sensory-guided movements of the arms and hands are essential for many activities of daily living, and pathological processes that impair the cortical circuits mediating these behaviors are a common cause of disability. To better understand and treat these disorders, it will be important to understand the cellular mechanisms in these circuits.

Shepherd's team previously elucidated many aspects of the circuit organization of primary motor cortex (M1) neurons in the forelimb area of mouse neocortex. However, a fundamental question remains poorly understood: How are forelimb M1 neurons integrated into functional synaptic circuits with the cells and circuits of primary somatosensory cortex (S1)?

In this research, investigators will test a series of predictions about the cellular organization of the forelimb S1-M1 circuit. Their overall aim is to determine the cellular basis for key long-range excitatory circuit connections that mediate communication between forelimb S1 and M1, and between these areas and somatosensory and motor nuclei in the thalamus.

[Read more about this project.](#)



**PI: Robert Vassar, PhD, professor of  
Neurology in the Division of Behavioral  
Neurology and of Cell and Molecular  
Biology**

**Sponsor: National Institute on Aging**

**Title: Molecular and Cellular  
Mechanisms of the UNC5C Netrin**

**Receptor In Alzheimer's Disease Pathogenesis**

The mechanism of neuron death in Alzheimer's disease is enigmatic; however, a newly discovered mutation in the gene for UNC5C — a rare coding mutation called T835M — increases the vulnerability of neurons to Alzheimer's-associated stresses.

Vassar's team will investigate their hypothesis that UNC5C T835M predisposes to late onset Alzheimer's by making neurons more vulnerable to cell death induced by pathogenic amyloid beta and tau proteins. The investigators will define cell death pathways in mouse models of amyloid beta and tau pathology crossed to knockin mice in which UNC5C T835M is expressed endogenously; identify cell death pathways in human induced pluripotent stem cell neurons generated from UNC5C T835M patient fibroblasts; and use mass spectrometry-based proteomics to determine the comprehensive UNC5C T835M cell death proteome.

The team hopes to determine the mechanism of UNC5C-associated neuron death and design strategies to prevent neuron death as a proof of concept for new therapies.

[Read more about this project.](#)



## Welcome New Faculty

Judd Hultquist, PhD, joins us as an assistant professor of Medicine in the Division of Infectious Diseases. His research focuses on mapping the functional plasticity in host-pathogen interactions in primary models of disease. Leveraging expertise in primary cell modeling, proteomic profiling and functional genomics, his research group studies the changing landscape of protein-protein interactions, post-translational modifications, gene expression profiles and functional dependencies that unfold during the course of viral infection. His goal is to strengthen the bridge from big data to targeted discovery to clinical application for the development of personalized, host-driven therapies and the betterment of human health.

Hultquist earned his PhD in molecular biology and virology from the University of Minnesota before serving as a postdoctoral fellow in systems biology at the J. David Gladstone Institutes in San Francisco. He has published more than 20 primary research articles, including landmark studies in *Nature* and *Cell*, and is the currently principal investigator on a K22 grant funded by the National Institutes of Health investigating the genetic determinants of HIV latency establishment and maintenance. He is the recipient of numerous awards, honors, and fellowships for his research and academic achievements and has participated in several outreach efforts to raise awareness of the ongoing fight against the AIDS epidemic. Watch his latest video for the American Foundation for AIDS Research Epic Voices project [here](#).