Autism spectrum disorder (ASD) is diagnosed in roughly 1% of the population and has complex genetic roots. Analysis of fine and de novo sequence variation in ASD has had prior success in identifying genes and the biology underlying ASD. However, most of the disease-associated variants do not reside in protein-coding sequence, and it finds the interpretation of the sequencing results. The current study aims to identify key disease elements that are functional within the gene sequences and will provide the basis for identifying and functional studies of ASD-associated non-coding variants and their role in ASD pathology.

Chronic pain conditions affect a large number of the population. Male-specific mechanisms of chronic pain may help reduce addiction and relapse in human populations. Understanding the function of the hippocampus is crucial for developing new target treatments for transdiagnostic social dysfunction. The traditional view of the hippocampus is that it creates a neural representation of physical space but new results show that it encodes multi-modal information, including social interactions. This project will profile human blood for such factors that may drive the disease process, screen these activities in a newly developed animal model to examine key disease hallmarks.

In vivo imaging of neuronal activity in the nonhuman primate brain with miniature fluorescent microscopes has been powerful tools to visualize the activity of large populations of neurons in defined circuits in the mouse brain. We will extend this technology to human patients. With this technology, we will be able to see how specific neural circuits respond in complex tasks, decision-making, and memory. The work will give new insights into how the activity of specific brain circuits might be modulated to improve decision-making and memory in brain disorders, including Alzheimer’s disease and substance addiction.