

Neuroscience Seminar Series schedule

All seminars are currently scheduled from 4-5 pm mountain time. Currently, all the speakers are schedule to present in-person, but this may change; I will keep you posted.

Fall 2022

September 6, 2022 – Dr. Kate Wassum (in person)
Professor, Department of Psychology, University of California at Los Angeles

Title: **Corticoamygdala circuits in reward learning and decision making.**

Abstract: To make adaptive decisions we must cast ourselves into the future and consider the outcomes of our potential choices. This prospective consideration is informed by our memories. What has happened in the past informs what we think will happen in the future. I will discuss our lab's recent work investigating the neural circuits responsible for encoding, updating, and retrieving reward memories for use in the considerations underlying decision making. We have taken a multifaceted approach to these investigations, combining recording, modern circuit dissection, and behavioral tools. Our results are indicating that the basolateral amygdala, midbrain, and orbitofrontal cortex work in a circuit to participate in these functions. The cognitive symptoms underlying many psychiatric disorders result from a failure to appropriately learn about and/or anticipate potential future events, making these basic science data relevant to the understanding and potential treatment of mental illness.

September 22, 2022 – Dr. Won Chan Oh (in person)
Assistant Professor, Department of Pharmacology, University of Colorado School of
Medicine, Aurora, CO

Title: Wiring the brain: cellular and molecular mechanisms of neural circuit formation.

Abstract: Synapses are intercellular junctions specialized for fast and reliable transfer of neural information, and thereby connect billions of neurons into neural circuits. To date, studies of synapse development have primarily focused on input-specific synaptic mechanisms, with decades of work committed to defining how excitatory and inhibitory synaptic activities regulate synapse formation and stabilization and how they are altered in disease. Currently, however, our understanding of how alterations in neuromodulation (i.e. dopamine, serotonin, and ACh) contribute to the etiologies that underlie neurodevelopmental disorders is extremely limited due to a lack of fundamental understanding about the central roles of neuromodulators in early brain development. I will give a general introduction to this topic and discuss our own recent findings showing how neuromodulators shape the early establishment of neuronal circuitry in the developing prefrontal cortex in mice.

October 4, 2022 – Dr. Mark Mikkelsen (in person)

Assistant Professor of Neuroimaging in Radiology, MRI Research Institute, Weill Cornell Medicine, New York, NY

Title: In vivo magnetic resonance spectroscopy (MRS): An old and new MR technique for noninvasively quantifying chemical compounds in the human brain.

Abstract: Magnetic resonance imaging (MRI) is the most important biomedical imaging technique that has improved human health. When most people think about MRI, they specifically refer to imaging based on a signal derived from our bodies' abundant water content. However, an MR approach older than MRI exists: MR spectroscopy (MRS). Although nowhere near as popular as MRI, MRS is a powerful tool for noninvasively detecting and quantifying many chemical compounds in vivo. In this seminar, I will first introduce MRS and some current methodologies employed. I will then speak about MRS spectral editing of low-concentration metabolites, such as the chief inhibitory neurotransmitter gamma-aminobutyric acid (GABA) and the antioxidant glutathione (GSH). A separate section of my talk will focus on a large multi-site project involving 26 institutions worldwide to address some outstanding differences in implementing edited MRS. To show the worth of MRS for neuroscience, I will also present some of my previous work using edited MRS to measure GABA and provide insights into abnormalities in neurodevelopmental disorders. Finally, I will discuss some recent advances in editing that allow multiple low-concentration metabolites to be simultaneously measured unambiguously and reliably.

October 18, 2022 – Dr. Ethan Hughes (in person)

Assistant Professor, Cell and Developmental Biology, University of Colorado School of Medicine, Aurora, CO

Title: **Oligodendroglia: Implications for adult CNS plasticity and repair**

Abstract: Oligodendrocytes form myelin sheaths around neuronal axons in the CNS to facilitate fast, precise communication between neurons. Work over the last ten years shows that learning and memory not only increase but also require the formation of new oligodendrocytes. Previous studies show that exogenous neuronal activity can drive oligodendrogenesis and the subsequent myelination of specific axons in the adult brain. Furthermore, specific patterns of exogenous stimulation can differentially regulate oligodendrocyte precursor proliferation and/or differentiation to generate adult-born oligodendrocytes. Recent work from our laboratory shows that motor learning exquisitely modulates the generation of new oligodendrocytes as well as remodels pre-existing myelin sheaths of mature oligodendrocytes. Amazingly, the field has a limited grasp of how the myelination of axons is specifically modified by behavior on neuronal ensembles associated with learning or life experience. This disconnect represents a dramatic gap of knowledge that is absolutely required for understanding the consequences and implications of modifying myelination as a form of neural plasticity in the adult brain.

November 1, 2022 – Dr. Meredith Course (in person)
Assistant Professor, Molecular Biology, Colorado College, Colorado Springs, CO

Title: **Alternative splicing of PSEN1/2 in Alzheimer's disease.**

Abstract: Over 30 million people suffer from Alzheimer's disease worldwide, making it the most common form of neurodegeneration. DNA changes in the genes *PSEN1* and *PSEN2* are already well-known causes of inherited Alzheimer's disease. But what about changes in the RNA produced by these genes? In our recent paper, we leveraged long-read sequencing technology to present surprising evidence that changes in the RNA produced by *PSEN2* are associated with non-inherited Alzheimer's disease, but not inherited Alzheimer's disease. We also present evidence to support a controversial hypothesis about how changes in *PSEN1/2* lead to disease. This talk will cover what is and isn't known about *PSEN1/2* in Alzheimer's disease and show the importance of studying RNA to better understand neurological disease.

December 6, 2022 – Dr. Maria Diehl Faryna (in person)
Assistant Professor, Department of Psychological Sciences, Kansas State University,
Manhattan, KS

Title: The role of anterior cingulate cortex during active avoidance under social conditions in rats.

Abstract: Individuals suffering from post-traumatic stress disorder (PTSD) and anxiety disorders show excessive fear and persistent avoidance of activities, places, or people associated with their emotional trauma. Not only does emotional trauma impair one's ability to appropriately assess dangerous situations, but may also lead to deficits in social behavior. One of the broad questions of the Diehl Lab is to understand the neural mechanisms of active avoidance under social conditions. To study the effect of social conditions on avoidance circuits, rats undergo platform-mediated avoidance (PMA), in which they avoid a tone-signaled shock by stepping onto a safe platform, in the presence of another rat. This social partner will be either an experienced demonstrator (PMA-conditioned) or naïve (no previous PMA conditioning). Our preliminary findings have revealed behavioral differences when rats learn to avoid alone or with a partner. Specifically, we were surprised to find that rats freeze more during the PMA task in the presence of a partner compared to when they undergo PMA training alone. To understand the neural circuits of avoidance, we are using an optogenetic approach to photosilence the anterior cingulate cortex (ACC; an area known to play a role in social learning) to determine if this prefrontal region is necessary for avoidance under social vs. solo conditions. These findings will further our understanding of the differences between the neural circuits of active avoidance under social versus solo conditions and their relevance to PTSD and other anxiety disorders.