Summer Research Openings

Opportunity with Dr. James Chen’s laboratory
Lab Mentor: Dr. Thomas Bearrood
Project Title: Development of ALDH1B1 inhibitors and applications in colorectal cancer
Project Description:
The Chen lab integrates synthetic chemistry, protein biochemistry, molecular biology, cell signaling, and animal models as we endeavor towards new discoveries in developmental and cancer biology. We recently identified the first selective inhibitors for ALDH1B1, an enzyme that is important for the progression of colorectal cancer (CRC). With these inhibitors, we can begin to probe the effects of ALDH1B1 inhibition with temporal control and understand the molecular role of ALDH1B1 in CRC. However, the biostability of the molecules remains a problem as we seek to apply the inhibitors in more complex systems (e.g., mouse models). This project is an excellent opportunity for students interested in learning a diverse set of chemical biology techniques starting with synthetic chemistry and continuing through biological assays to evaluate their new inhibitors.
Key Words: cancer, cancer stem cells, medicinal chemistry, pharmaceutical chemistry
*Interested students and/or those who would like to learn more information can contact Dr. Thomas Bearrood at bearrood@stanford.edu.

Opportunity with Dr. Neir Eshel’s laboratory
Lab Mentor: Dr. Neir Eshel
Project Title: Neural circuits of addiction and aggression
Project Description:
The Stanford Translational Addiction and Aggression Research (STAAR) lab focuses on the neural circuits of reward, aggression, and the intersection between the two. Current questions include: What is the economic value of dopamine release? How do neuromodulators influence aggression? What are the neural circuits of frustration? To answer these questions, we pair the latest neuroscience methods (fiber photometry, optogenetics, electrophysiology) with carefully-controlled behaviors (operant conditioning, social interaction) and sophisticated analyses (economic demand curves, machine learning). An amazing Stanford undergrad is currently completing his senior thesis in the lab, working on the role of serotonin in aggression, and there are ready-made follow-up projects for future undergraduates.
Key Words: addiction, aggression, neural circuits, dopamine, serotonin
*Interested students can check out the lab website (https://www.staarlab.com/) and write to Dr. Eshel (neshel@stanford.edu) to find out more.

Opportunity with Dr. Tamar Green’s laboratory
Lab Mentor: Dr. Monica Siqueiros Sanchez
Project Title: Towards clinical translation of imaging studies in neurofibromatosis type 1
Project Description:
The Green lab takes a “genetics first” approach to understanding neurodevelopmental disorders by studying children with neurogenetic syndromes, specifically “the rasopathies”. Rasopathies are a collection of syndromes where genetic mutations affect the RMK pathway and result in multisystemic disorder, including measurable effects on behavior and cognition (e.g., deficits in cognitive and social skills). One of their projects focuses on one of these conditions, neurofibromatosis type (NF-1). Studies of NF1 show compelling evidence for abnormalities in structural MRI, whole-brain abnormalities in white matter microstructure, and resting-state fMRI. However, the usability of these effects as outcome measures is limited. Here, the aim is to utilize these three imaging modalities along with a battery of cognitive-behavioral assessments, to define a syndrome-specific profile of brain-based correlates that can serve as a set of sensitive markers for intervention effects.

**Key Words:** MRI, neurogenetic syndromes, ADHD

*If this type of research interests you and you would like to participate or just find out more, please contact Dr. Monica Siqueiros at msiquei@stanford.edu and/or visit the BRIDGE Lab website: [https://web.stanford.edu/group/bridgelab/](https://web.stanford.edu/group/bridgelab/)*

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**Opportunity with Dr. Allan Reiss’s laboratory**

**Lab Mentor:** Dr. Lara Foland-Ross  
**Project Title:** Investigating the influence of genes and hormones on male adolescent neurodevelopment  
**Project Description:**  
At the Center for Interdisciplinary Brain Sciences Research (CIBSR), we investigate neurodevelopment in children and teens and strive to understand how changes in behavior and cognitive function are associated with longitudinal alterations in brain function and structure. We are currently conducting a study of adolescent neurodevelopment in males with Klinefelter syndrome – a genetic condition that is characterized by an extra X chromosome (47,XXY). In this longitudinal research project, we use genetics, hormones, MRI, and behavioral assessments to better understand the role of sex chromosomes and gonadal hormones in shaping the brain and executive and socio-emotional function. This project represents a wonderful opportunity for students interested in exploring the influence of genes and/or pubertal hormones on adolescent neurodevelopment and behavior.  
**Key Words:** MRI, puberty, brain, genetics, depression, anxiety, cognition, adolescence  
*If this type of research interests you and you would like to participate or just find out more, please contact Dr. Lara Foland-Ross at lfoland@stanford.edu and/or visit the study website: [https://med.stanford.edu/bgapstudy/about.html](https://med.stanford.edu/bgapstudy/about.html)*

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**Opportunity with Dr. Allan Reiss’s laboratory**

**Lab Mentor:** Dr. Stephanie Van Riper  
**Project Title:** Functional Neuroimaging of the Cognitive Load of Exercise in Attention-Deficit/Hyperactivity Disorder  
**Project Description:**
The Brain Exercise and Fitness (BRExFit) Lab, under the direction of Dr. Allan Reiss, is looking for undergraduates to assist in research related to the neurobiology of cognition in children and adolescents with neurodevelopmental disorders. This work will involve using functional Near-infrared Spectroscopy (fNIRS) to measure brain activity before, during, and after exercise. A variety of experimental techniques are employed and will thus provide students with a diverse experience that spans multiple disciplines including neuroscience, psychology, exercise physiology, and computer science. The overall aim of this research is to develop exercise protocols that may benefit individuals with cognitive dysfunction such as attention deficit/hyperactivity disorder (ADHD) and Autism.

Key words: cognitive function, exercise, neuroimaging, ADHD

*Interested students and/or those who would like to learn more information can contact Dr. Stephanie Van Riper at vanriper@stanford.edu.*