The Friedman Brain Institute Announces
2024-25 FBI Research Scholars

On behalf of the Philanthropic Leadership Council of The Friedman Brain Institute, we are pleased to announce the 2024-25 recipients of The FBI Research Scholars Awards.

Ram Sundaram and Preethi Krishna Research Scholar Award

Abha K Rajbhandari, PhD
Assistant Professor, Psychiatry and Neuroscience

Filip Swirski, PhD
Professor, Medicine, Cardiology, Diagnostic, Molecular & Interventional Radiology and Immunology & Immunotherapy

Delineating the role of a brain to heart pathway in stress-related behavioral and cardiac function.

Post-traumatic stress disorder (PTSD) increases the risk of cardiovascular disease, affecting both mental well-being and heart health. This connection is linked to an imbalance in the autonomic nervous system, where the sympathetic nervous system (SNS) raises heart rate, while the parasympathetic nervous system (PNS), through the brainstem's nucleus ambiguus (NAmb), lowers it. PTSD patients often have heightened SNS activity and reduced PNS activity, leading to elevated resting heart rate and lower heart rate variability. Our research focuses on a key neuropeptide in the NAmb-to-heart pathway to understand how it regulates stress-related cardiac and behavioral responses, informing potential new therapeutic avenues for PTSD-related cardiac dysfunctions.

Nash Family Research Scholar Award

Chrystian Junqueira Alves, PhD
Assistant Professor, Neuroscience

Daniel da Silva, PhD, MSc
Assistant Professor, Neuroscience

Mechano-Electrical Regulation of Neurogenesis.

Dysregulation of neuroprogenitor cells during brain development can cause disorders like autism and microcephaly. While transcription factors are well-studied, fundamental aspects like plasma membrane properties and cytoskeleton mechanics remain overlooked. This project explores how inner membrane surface charge influences neuroprogenitor cells differentiation and neuronal diversity during cortical development. Using voltage imaging, membrane fluorescent probes, and patch-clamp recordings, we aim to uncover how membrane charge dynamics impacts neurogenesis. We will test engineered molecular actuators that increase negative membrane charge and disrupts the cortical actin, potentially inducing neuronal lineage commitment. Results will provide insights into cortical layer formation and inform future therapies for neurodevelopmental disorders.

Lipschultz Research Scholar Award

Deepak Kaji, MD, PhD
Instructor, Psychiatry

Unraveling the Acute and Chronic Effects of NMDA-R inhibition on neocortical development and network function.

Schizophrenia is a neurodevelopmental disorder linked to glutamatergic dysfunction. While NMDA-R antagonism with ketamine mimics schizophrenia symptoms in healthy individuals, it fails to capture the neurodevelopmental elements of the disease and has made it difficult to design effective treatments. This study proposes using human induced pluripotent stem cells (hiPSCs) to create 3D neocortical organoids and compare the effects of acute and chronic ketamine exposure, with organoids generated from healthy control lines, and iPSC lines from patients with schizophrenia. We hypothesize that comparing the transcriptomic and electrophysiological signatures from these four conditions will untangle the temporal contributions of NMDA-R dysfunction to schizophrenia and lead to the development of new pharmacologics.

Joseph and Nancy DiSabato Research Scholar Award

Eun-Jeong Yang, PhD
Instructor, Neurology

Pre-clinical evaluation of safety and efficacy of Alzheimer's Disease immunotherapeutics delivered with focused ultrasound.

Disease-modifying therapies, including anti-amyloid beta (Aβ) monoclonal antibodies (mAbs) such as aducanumab, lecanemab, and donanemab, represent a significant breakthrough in Alzheimer's disease (AD) therapeutics. However, their clinical application is constrained by limited brain penetration and adverse effects, including vascular complications. Focused ultrasound (FUS) has emerged as a promising approach to transiently open the blood-brain barrier (BBB), enhancing mAb delivery to the brain. This study aims to evaluate the safety and efficacy of FUS-mediated mAb delivery in AD mouse models, with a specific focus on mitigating vascular damage associated with high-dose mAb therapy. The findings seek to optimize therapeutic outcomes while minimizing associated risks.

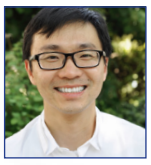
Jane Martin and Stuart Katz Research Scholar Award

Evan Schaffer, PhD
Assistant Professor, Neuroscience

Identifying mechanisms for stable memory and generalization: New Insights Into Alzheimer's Disease.

The failure to accurately generalize, or to apply learned associations to new contexts, is a prominent feature of Alzheimer's Disease pathology. The ability to generalize critically depends on the neural representation of similar stimuli being similar. Our goal is to build a mathematical understanding of when this similarity criterion is guaranteed to be true in healthy brains and what neural insults could cause it to fail in disease. A better understanding of how insults to the hippocampal network result in deficits in the ability to generalize will lay the foundation for new treatments and diagnostic tools for dementias.

Glickenhaus Research Scholar Award



Zheng (Herbert) Wu, PhD
Assistant Professor, Neuroscience

Sai Ma, PhD
Assistant Professor, Genetics & Genomic Sciences

Neural Activity-Dependent Regulation of Transcriptomic Landscape: A Novel Approach to Addiction.

This project aims to uncover how the Fos family transcription factors mediate neural activity-dependent changes in gene expression, linking addiction-driven behaviors to molecular mechanisms. In the first aim, we will develop a novel technology to jointly measure Fos protein levels, DNA binding sites, and gene expression changes across approximately one million single cells in the premotor cortex. The second aim will pioneer a platform that spatially links neuronal activity, chromatin accessibility, and RNA profiles. Together, these advanced tools will elucidate how neural activity reshapes transcription, providing new insights and potential therapeutic targets for substance use disorders.

Richard and Susan Friedman Research Scholar Award

Stuti Bansal, BA
MD-PhD Student, Neuroscience

Yael Jacob, PhD
Assistant Professor, Psychiatry

Laurel Morris, PhD
Adjunct Associate Professor, Psychiatry

James Murrough, MD, PhD
Professor, Psychiatry and Neuroscience

Characterizing the Brain Microstructure Underlying the Antidepressant Effects of Ketamine and Transcranial Magnetic Stimulation Interventions.

Most patients with major depressive disorder do not achieve remission with first-line treatments. Ketamine and repetitive transcranial magnetic stimulation (rTMS) are rapid-acting treatments for treatment-resistant depression (TRD), but their underlying mechanisms are not well understood. Both treatments seem to work via synaptic plasticity mechanisms, but these effects are difficult to observe in living humans. NODDI (Neurite Orientation Dispersion and Density Imaging) is a diffusion weighted imaging model that can capture the density and angular complexity of dendrites and axons. We will collect NODDI scans in TRD patients receiving either ketamine or rTMS, in order to investigate treatment-induced synaptic plasticity effects.

Fascitelli Research Scholar Award

Yun Soung Kim, PhD
Assistant Professor, Diagnostic, Molecular & Interventional Radiology and BioMedical Engineering & Imaging Institute

Maria de las Mercedes Perez-Rodriguez, MD, PhD
Associate Professor, Psychiatry

Ankit Parekh, PhD
Assistant Professor, Medicine, Pulmonary, Critical Care & Sleep Medicine and Artificial Intelligence & Human Health

Assessing Perinatal Sleep's Role in Postpartum Mental Health and Maternal Caregiving Behaviors with a Multifunctional Forehead Patch.

We leverage an innovative wearable EEG-based forehead patch to study sleep and circadian rhythms in the perinatal period, a critical window for maternal mental health. Sleep disruption increases risk for perinatal mood and anxiety disorders (PMADs), which affect 1 in 4 women and can have long-term impacts in the offspring. Unlike traditional polysomnography, this patch enables at-home, high-resolution monitoring. We will correlate sleep patterns with mental health symptoms, inflammatory biomarkers, infant outcomes and maternal-infant caregiving, providing critical feasibility data. This study establishes a novel framework for early PMAD detection, informing future large-scale interventions to improve maternal health and offspring outcomes.

Icahn School of Medicine at Mount Sinai

The Friedman Brain Institute