@UIowaNeuro Notes

January 2023

If you follow the INI on social media, you've noticed our feeds flooded with student and postdoc research for the last week. The annual Dare to Discover campaign from the UI Vice President for Research includes so many neuroscientists that it's taking us more than a week to highlight them individually. They run the spectrum from undergraduate to postdoc, and the 10 graduate students represent five different programs. This is just a fantastic representation of the interdisciplinary and collaborative nature of Iowa neuroscience and our commitment to training the next generation.

Starting with undergraduates, we have students from the College of Liberal Arts and Sciences working in CLAS and Carver College of Medicine faculty labs. I am eager to see what comes next for each of them following graduation in May.

Daniel Fu (*left*), a biomedical sciences major with a minor in philosophy and a certificate in clinical and translational studies, studies proteins involved in signaling within cells in the Fisher Lab. He is working to enhance understanding of how this signaling mediates exercise-induced adult neurogenesis in Alzheimer's disease. This research could have a profound impact on maintaining cognitive health in aging.

Noah Gilkes (*center*), a neuroscience and philosophy double major, is part of a team in the Newell Lab studying the impact of traumatic brain injury. He studies how these changes in the brain lead to large-scale changes in the immune system and how this impacts predicting health outcomes after injury. The goal is to uncover protective therapies for the estimated 3 million people in the U.S. who experience brain injury annually.

Preston Johnson (*right*), a neuroscience major with a minor in theater arts and a certificate in clinical and translational studies, works in the McCleery Lab to better understand how serious mental illness extends beyond clinical symptoms to affect many aspects of day-to-day life. Identifying how serious mental illness extends beyond clinical symptoms to impact things like information processing skills, social cognition, and motivation could lead to more clarity regarding the underlying causes of illness and guide development of effective intervention strategies.

These 10 outstanding graduate students represent interdisciplinary programs in neuroscience, genetics, human toxicology, and experimental pathology.

Alexandra Alario (*left*), a neuroscience student in the Niciu Lab studies treatment-resistant depression to understand how these treatments modulate the excitability of the brain. The goal is to find predictors of treatment response to interventions for depression and to reduce the psychiatric illness burden with personalized treatments.

Amanda Bullert, (*second from left*) a neuroscience student in the Lehmler Lab, studies the influence of polychlorinated biphenyls (PCBs), a class of persistent organic pollutants, on the adolescent brain. She models possible PCB exposures in school-aged children to determine if there are neurodevelopmental effects. She wants to help minimize PCB sources indoors, especially in older school buildings, and maximize student health and safety.

Genetics student **AnneMarie Carver** (*center*) in the Stevens Lab studies the impact of placental genetics on fetal neurodevelopment. Specifically, she is seeking to determine how the expression of a placental growth factor essential for proper fetal brain growth can lead to changes in neurodevelopment that may contribute to the development of autism spectrum disorder. While the placenta is often ignored in developmental studies, changes to its function can cause lifelong impacts, including on the brain.

Allie Daniel (*second from right*), a human toxicology student in the Gaine Lab is studying the connections between mental health and environmental toxins, such as organophosphate pesticides. It is possible that individuals with higher levels of these pesticides and byproducts in their blood and urine are more likely to exhibit signs of psychiatric distress such as depression and suicidal behavior. If she can establish this connection, it will help to identify those at risk for suicide sooner and enable interventions.

Kimberly Fiock (*right*), a biomedical science program student on the experimental pathology subtrack, is part of the Hefti Lab and studies how tau affects different types of cells in different areas of the brain. There is urgency to prevent tau toxicity, as tau-related neurodegenerative disease could triple in next 30 years. Understanding what makes each disease different on a cellular level, will open the door for developing treatments that are specific to each disease and, ultimately, slowing the development of Alzheimer's disease and related dementias.

Micah Johnson (*left*), a neuroscience graduate student in the Hultman Lab, is working to bridge the gap between brain networks, early life stress, and migraine-related pain to discover how to manipulate brain circuits to provide better outcomes for people with migraine. By combining molecular, neurophysiological, and imaging approaches, she hopes to pave the way for more individualized therapeutic options for treating brain disorders.

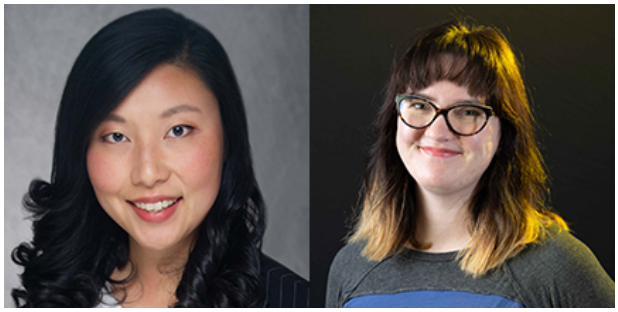
Matthew McGregor (*second from left*), a neuroscience graduate student in the LaLumiere Lab studies the neurobiology of addiction and relapse, working to identify the mechanisms that regulate opioid craving and seeking. Relapse rates are particularly high among opioid users, yet the mechanisms that select for opioid seeking versus the inhibition of this behavior remain largely unknown. By determining the role of specific pathways in regulating heroin seeking, his work will advance our understanding of the neural circuits that drive motivated behaviors in the face of adverse outcomes.

A December neuroscience PhD graduate from the Buchanan Lab, **Alex Petrucci** (*center*) seeks to identify brain mechanisms underlying sudden unexpected death in epilepsy (SUDEP) and potential SUDEP risk factors. After a seizure, there is a protracted period of low brain activity that may increase SUDEP risk. By studying the interplay between serotonin, the dorsal raphe, and the downstream targets of the dorsal raphe, Alex is working to determine how this low brain activity occurs and how best to reduce it.

Genetics student **Krislen Tison** (*second from right*) in Aislinn Williams's Lab is focused on understanding the gene transcriptional changes that occur in psychiatric disorders, such as schizophrenia, across neurodevelopment in the cerebellum. As many as 30 percent of patients are resistant to currently available treatments for schizophrenia. Krislen's work is contributing to identifying rational targets for therapeutic and diagnostic strategies in psychiatric disorder management.

Brittany Todd (*right*), a neuroscience student in the MSTP program, works with Alex Bassuk and Beth Newell to better understand the pathways that contribute to chronic neurotoxic inflammation in order to develop new treatments for traumatic brain injury. The same inflammatory pathways that are activated after traumatic brain injury are also implicated in several other neurodegenerative diseases, including Alzheimer's disease, stroke, and Parkinson's disease. Any knowledge gained from this research will be broadly applicable to many different patient populations and disease states.

Two neuroscience postdocs round out our participation in the Dare to Discover campaign.



Sunny Huang in the Carter Lab seeks to develop simpler, more efficient technologies to treat disease without detrimental side effects. The lab is focused on developing the next generation of electromagnetic medicines, and Sunny is an integral part of that work, having collaborated with Calvin Carter since their days in the Sheffield Lab.

Sara Maurer in the Stevens Lab assesses how stress during pregnancy leads to changes in placental and brain development--particularly in the striatum, a brain region implicated in neurodevelopmental disorders such as autism spectrum disorder. Deciphering the developmental origin of neurodevelopmental disorder incidence will allow future research and healthcare interventions to harness it to prevent these disorders.

We are fortunate to have such a high profile, university-wide celebration of student and postdoc research each year. In the INI, it represents a terrific opportunity to celebrate all of you who are pursuing discovery every day at lab benches across the university. We depend on our creative students and postdocs to make fundamental advances in neuroscience. I am filled with pride to see all of these faces larger than life on the downtown Iowa City banners.

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