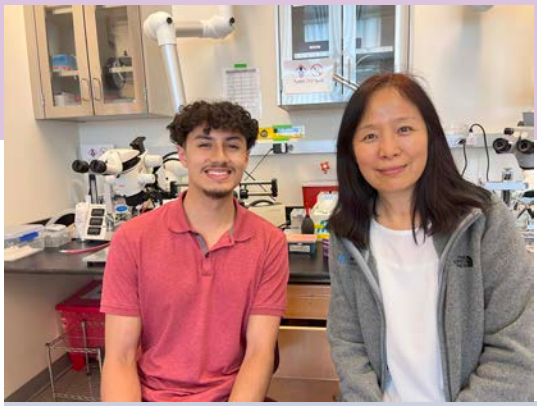
Simons Center MSRP 2024 Summer students

The 2024 MIT Summer Neuroscience Program brought together a diverse group of undergraduate students from across the nation for an intensive 10-week research experience. Hosted by the Department of Brain and Cognitive Sciences, the Center for Brains, Minds, and Machines, and the Department of Biology, the program offered non-MIT students an opportunity to engage in hands-on research in world-class facilities. Funded in part by MIT's School of Science, the National Science Foundation, and the Simons Center for the Social Brain, the program focused on inspiring students from underrepresented backgrounds to pursue graduate studies and careers in basic research. Participants worked closely with faculty and graduate mentors on a range of cutting-edge projects, from exploring the neural mechanisms underlying behavior to investigating brain development and disorders.

Raul Hernandez | Junior, Morgan Community College

Laboratory: Fan Wang, McGovern Institute for Brain Research, MIT

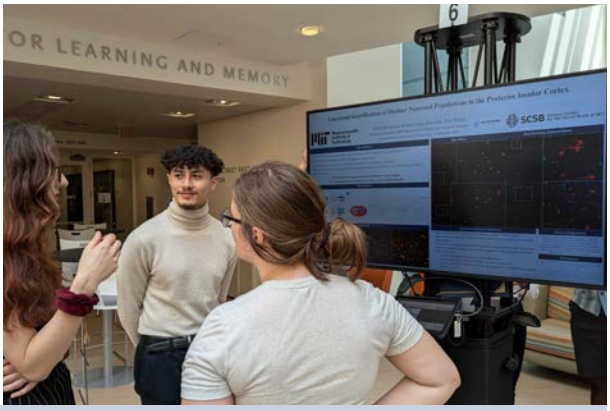
Project: Functional identification of distinct neuronal populations in the posterior insular cortex



Raul and Fan Wang.
Photo courtesy of Mandana Sassanfar

This summer I was an MSRP student in the lab of Fan Wang. My research was focused on understanding pain processing within the brain. We were specifically looking at one brain region, the posterior insular cortex (pIC). Previous studies have shown the pIC's unique role in processing pain, however pain processing is not the only function of the insular cortex. The insular cortex is also known to encode for other aversive states and behaviors such as hunger, thirst and stress. So our research was meant to answer the questions: what states/behaviors are encoded within the neuronal populations within the pIC? And how does the pIC process these different aversive stimuli? Our hypothesis is that distinct neuronal populations within the pIC encode for different aversive states.

In order to test our hypothesis we implemented the Fos-TRAP2 method in our experiments, a genetic tool that we can use to functionally identify active cells. Neurons responding to pain stimuli were labeled using TRAP2, and after two weeks, the same mice were either re-exposed to pain or subjected to hunger, thirst, or restraint-induced stress. Following perfusion and Fos staining, we analyzed whether the neuronal populations activated by the second condition overlapped with those initially TRAPed by the pain experience. We expect higher overlap in mice re-exposed to pain than in those exposed to different aversive conditions.



Raul presenting at the MSRP Poster Session.
Photo courtesy of Raul Hernandez

Due to time constraints we were unable to quantify the overlap between the TRAP'ed cells and Fos stained cells. Future plans would include quantifying the amount of overlap within these neuronal populations to determine if they encode for distinct or overlapping aversive states/behaviors, as well as optimizing the Fos-TRAP2 method to TRAP the most cells possible. Understanding these mechanisms in the pIC could inform targeted therapies for chronic pain and anxiety.