**Research Poster Abstract**

Membrane proteins subunits associate to fold into biologically essential structures as a result of forces including hydrogen bonding, weak polar interactions, and van der Waals packing. After a membrane protein is inserted into the membrane, a combination of these forces stabilizes the folded state. Previous research has investigated the impact of hydrogen bonding and weak polar interactions on membrane protein association, however, the contribution of van der Waals packing to association in the folded state remains poorly understood. Van der Waals packing is a complex set of diverse interactions comprised of lipid-lipid packing, lipid-protein packing, and protein-protein packing, which collectively stabilize both the unfolded and folded states. Each of these interactions must be taken into account to understand the contribution of packing to membrane protein association in the folded state, but prior research has found difficulty isolating these interactions from each other and from other stabilizing forces. Literature suggests that protein-protein packing, or sidechain packing, plays a significant role in membrane protein stability, demonstrating that optimized sidechain packing alone can stabilize the folded state. However, the relative contribution of this force to the stable structure of a membrane protein has not yet been determined. My work aims to control for other stabilizing forces to study the extent at which sidechain packing can stabilize membrane protein structure. To investigate this question, I will use helical dimers which are a simple and tractable model system for the association of membrane protein subunits during folding. Using established computational design techniques, I will engineer dimeric sequences with an array of sidechain packing energies to determine how much packing is necessary for stability of the folded state. Using a high throughput in vivo assay that combines fluorescence activated cell sorting and next generation sequencing, I will screen the dimerization propensity of each construct, to identify correlations between computational and experimental stability. Then, I will make point mutants on my designed structures and measure changes in thermodynamic stability using in vitro FRET. This will allow me to confirm the correlation seen between sidechain packing and dimerization propensity in sort-seq and estimate the free energies of my designed constructs. This work will provide a better understanding of how sidechain packing can facilitate and stabilize membrane protein association and addresses a crucial knowledge gap in our understanding of membrane protein biology.

**Diversity Essay**

Everyone’s story is different.

From experiencing microaggressions, coming from an impoverished background, or blatant racist experiences, many diverse individuals share some form of these stories with one another. However, the most important part of having diversity in science is not only sharing these stories, but allowing them to have an impact within the future of the scientific community so that scientists can focus on doing good science rather than questioning their skills because of the color of their skin.

When I was accepted into graduate school at the University of Madison, WI, I immediately thought that I was accepted because I was different. I was one of few non-white students on the interview weekend, and I saw very few non-white students currently in the community. The fact that I could be accepted to such a prestigious community of students was unfathomable. When I received a fellowship for underrepresented students, I remember it being referred to by a white friend as my “minority” fellowship. And yet another time when I received an NIH sponsored training grant and my white friends did not, I was the one calling myself out, saying that I probably got it because I was a minority.

The fact that imposter syndrome within science is already so strong coupled with the imposter syndrome of being a minority in science is truly a unique path that we as diverse individuals take. I look back on those memories, feeling sorry for the student who had gotten lost as a scientist because of how I viewed myself: as a minority who isn’t as good as other students and is held to lower standards than my peers. Instead of allowing myself to excel as a student, I looked down on myself because of my skin. I was talked down by white students and became a shell of my own diverse being, thinking that I was just a way for my program and the school to look like it represents diversity. I was casting aside my own diversity as a crutch that allowed me to keep up rather than as the perspectives that allow me to excel as a good scientist.

Even today I still struggle with that way of thinking, having to remind myself that I belong in science and that I have been accepted for my merits and skills. The importance of having diversity in science is to increase the awareness of stories like mine and to change the way of thinking of students in the future. Instead of having students who doubt their abilities because of the color of their skin, I want students to be empowered to believe in their ability and their unique perspective in the world. By increasing diversity in science, we can help change how minorities in science are perceived as well as how minorities perceive themselves, aiming to allow students to use their perspectives to focus on doing good science rather than questioning their abilities because of the color of their skin.

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