"Understanding mitochondrial protein assembly in human health and disease"

The focus of the Brown Lab is to investigate 3-dimensional protein structure in order to understand how certain genetic mutations can have profound impact on human health.

In several instances, proper protein complex assembly is critical for maintaining human health by modulating various cellular processes such as activity of signaling pathways, providing feedback regulation, and mediating transport and transfer of molecules among partners. Unfortunately, there are numerous painful, debilitating, and life-threatening diseases that occur due to genetic mutations that prevent proper protein assembly. Our approach is to use X-ray crystallography and other complementary biochemical techniques to understand how these various mutations lead to changes in protein structure, which is tightly correlated to protein function, thus preventing proper macromolecular assembly.

We focus on areas of human health related to mitochondrial biology and metabolism. Specifically, we seek to understand assembly mechanisms responsible for regulation of heme biosynthesis, which is altered in several blood diseases, and maintenance of mitochondrial DNA copy number, which has direct implication in proper neuronal development. In the future, our work will lay the foundation for developing therapeutics that may take advantage of previously unknown cellular avenues.