The GLUT1 collaboration project explored the activity of glucose transporters and their effect in chronic diseases such as cancer and diabetes. Glucose transporters are proteins in a cell membrane that allow glucose, a sugar necessary for replication, into the cell. In cancerous cells, these proteins are hyperactive. On the other hand, in the case of diabetes, the proteins are not active enough. It is argued that GLUT1 proteins are most active in a multimeric conformation that is dependent on the protein concentration in the membrane and its lateral mobility. In a collaborative effort between the labs of Professors Eric Arnoys, Larry Louters, and Brenden Looyinga, nine students sought out to explain how the environment, concentration, multimerization, and movement of glucose transporters affected their activity.

My particular focus was to determine how glucose interacted with various other proteins of known cellular location. Studying this would potentially give us insight to the location of GLUT1 in the cellular membrane. Using a novel technique called Bioluminescent Resonance Energy Transfer (BRET), I was able to measure how closely proteins reside in a membrane. I was particularly interested in whether GLUT1 comes into contact with kRAS or hRAS. These two proteins are very similar with the exception of an attached hydrocarbon chain that determines their location in a membrane. HRAS is common in lipid rafts, or portions of the membrane that are heavy with cholesterol, while kRAS is found in the remaining sections of the membrane. A large portion of my summer was spent preparing clones of DNA segments that coded for these types of proteins. When the clones were prepared, I was able to insert these DNA segments into the cellular genome and have cells express the desired proteins. The BRET data reflects how much the proteins in question interact. My data suggests that the GLUT1 protein interacts with hRAS—the lipid raft protein. This would affirm our hypothesis that GLUT1 is concentrated and active in lipid rafts.

Because I worked on such a large project, I was exposed to a wide variety of lab techniques and skills. With nine students in the lab, we each mastered a separate skill yet were eager to teach each other what we had learned. The carefully designated work load allowed us to embrace the “see one, do one, teach one” method of learning. Of course, this learning process was rooted in a professor-student interaction that quickly transformed into a mentor-mentee collaboration. Professor Arnoys, my faculty supervisor, embraced every opportunity to encourage me to make my own conclusions and voice my thoughts. This practice became more and more rewarding as I began to understand that the data I collected is completely new to the scientific community. It is incredible to see that Calvin College, a liberal arts school in Grand Rapids, can produce information with such academic influence.

Working in the laboratory gave me an opportunity to ask “what if...?” and “why?” During the academic year, students are swamped with information to digest and memorize, and there is little time to invest in scientific curiosity. Because I was working over the summer, all additional responsibilities were absent from my day. Each step of the process gave way to another question to discover, and I was able to explore these questions with further experiments. This thought process was quite different from the “problem, solution, complete” way of thinking to which I was accustomed. Embracing a new way of thinking is important for me as I look forward to further education in the sciences.