Unlocking the Door into the Cell

The cell membrane is a remarkable feat of biological engineering. It is incredibly thin (< 5 nm), but also amazingly strong and flexible for its size. The membrane is a fluid, with components diffusing freely in two dimensions, yet, it is somehow able to effectively block the entry of undesirable molecules. Over the past two decades, an array of molecules has been developed that not only enter the cell spontaneously, but also carry very large molecules across the membrane. The mechanism of how molecules such as, cell-penetrating peptides, protein transduction domains, Trojan peptides, polyarginines and other similar molecules cross the membrane is hotly debated. The Holden Lab has developed a convenient membrane system called the droplet-interface bilayer (DIB), where the interface between the droplets is an artificially formed cell-membrane. With this, we quantitate peptide-mediated transport of an enzyme from one droplet into another as a function of membrane composition. We aim to identify the specific molecular interactions that govern peptide-mediated transport and hope to create a model that can assist the development of therapeutic delivery molecules.