

## **Research projects available in the Daniel group 2015**

*Each of the available 4 projects are envisioned as independent student projects (not team-based, but will involve interactions with other graduate students and collaborators of the Daniel Lab). Contact Prof. Daniel directly at [sd386@cornell.edu](mailto:sd386@cornell.edu). Please provide a resume and statement of interest.*

### **Characterization of mammalian plasma membrane microvesicles (cell blebs) for the collection of transmembrane proteins**

In this project we are aiming to characterize the differences among membrane microvesicles produced from mammalian cells under various conditions to maximize the production of transmembrane proteins (TMP) expressed in these vesicles. TMPs are notoriously difficult to handle due to their hydrophobic cores, which makes them challenging to purify and crystallize. It also limits their use in bioanalytical devices and biosensors, even though these devices are expected to have superior performance with their inclusion. This promise cannot be fully realized until reliable means to grow, collect, and deliver TMPs are developed. Recently our lab developed a method to deliver TMPs to a planar platform that circumvents purification and preserves TMP function, orientation, and mobility. This project will involve producing microvesicles under various cell growth conditions and characterizing them and their content to optimize production, but also determine impacts on proteins. It will rely on cell culture of mammalian cells, vesicle sizing and charge characterization using dynamic light scattering and electrophoresis, concentration determination using a nanosight instrument, and finally some quantification of protein content using western blots and similar techniques. Time permitting, protein activity and functionality will be tested and integration with planar platforms for bioanalytical assays of membrane sorting will be carried out.