

Announcing the Final Examination of Tommy Boykin II for the degree of Doctor of Philosophy in Physics

Date: March 29, 2019

Time: 12:30 p.m.

Room: CSB 221

Dissertation title: Self-Assembly of Reflectin Protein Probed by Solid-State Nuclear Magnetic Resonance

Abstract:

Proton-conducting materials are essential for many current electronic technologies, e.g. batteries. There are several non-renewable energy resources for proton-conductors. The next generation of batteries will be based on inexpensive, renewable energy resources from naturally proton-conducting materials. A proton-conducting squid protein called reflectin is a possible solution as a natural resource. Current bioelectronic materials, such as reflectin, require additional structural information to be optimized for specific devices, e.g. batteries. Reflectin has the potential to become electronically tunable in batteries, however, the molecular structure of reflectin has yet to be determined. In this dissertation, I will discuss synthesizing the reflectin protein as well as characterizing the structure by solid-state nuclear magnetic resonance (NMR).

In the first section, I will discuss the recombinant DNA methods followed to cleanly synthesize the reflectin protein. Synthesizing the reflectin protein is accomplished by determining the optimal growth conditions. I will present the growth conditions found to produce the greatest protein yield.

In the second section, I will discuss applying solid-state NMR to characterize the structure of the reflectin protein. The structure is characterized by acquiring one-dimensional and two-dimensional spectra at a site-specific resolution. I will present the one-dimensional and two-dimensional results from two separate packing conditions.

Outline of Studies:

Major: Physics

Educational Career:

M.S. University of Central Florida, 2016

B.A. Berea College, 2013

Committee in Charge:

Dr. Bo Chen (Chair)

Dr. Alfons Schulte

Dr. Suren Tatulian

Dr. Kenneth Teter (External Committee Member)

Approved for distribution by Dr. Bo Chen, Committee Chair, on March 15, 2019.

The public is welcome to attend.