

# Department of Physics and Astronomy

## Biophysics Seminar

Tuesday, November 7<sup>th</sup>, 2017

PHYS 242 at 1:30 pm

*(Refreshments served at 1:15 pm in PHYS 242)*

**Professor Lars Gundlach**

University of Delaware



### **“Ultrafast Charge Carrier Dynamics in Solar Energy Relevant Materials”**

**Ultrafast Charge Transfer Dynamics at Interfaces** is a critical process in surface catalysis, novel electronic applications and solar energy conversion. The fast kinetics (below 100 fs) and the inhomogeneous environment complicate identifying the parameters that dominate the reaction. We are investigating the role of vibrational coherence and its preservation throughout the progression of heterogeneous electron transfer by monitoring coherent oscillations in the dynamics of the excited state and the molecular cation by pump-degenerate four-wave mixing spectroscopy of the photoexcited chromophore. I will present ultrafast spectroscopic studies of model systems with well-defined variations in excess energy and dipole moment and address the importance of electronic-vibrational coupling for electron transfer.

**Spatial-resolved Ultrafast Luminescence Dynamics of Single Nanowires.** Transparent semiconducting nanowires are an important subject of recent experimental and theoretical investigations because of their potential applications in electronics, optoelectronics, and renewable energy. Charge carrier diffusion and lifetime are the most important parameters for any electronic application. I will show how charge carrier mobility can be extracted from contactless measurements on single ZnO nanowires with a novel femtosecond wide-field Kerr-gated UV luminescence microscope. Our work on single particle characterization is complemented by our synthesis of hierarchical tree-like nanostructure with CdSSe or CuO branches grown onto ZnO nanowire stems that are vertically-aligned on a substrate