Please join us for camaraderie, and to learn more about nanoparticles functionalization and surface engineering. Students are encouraged to attend at reduced price (see details below).

**Wednesday, April 18, 2018**

**Axel’s Bonfire**
850 Grand Ave., Saint Paul, MN 55105
651-312-1299

- 5:00 pm Social
- 6:00 pm Dinner
- 6:15 pm Presentation

“Quantitative Computational and Experimental Characterization of Functionalized Nanoparticles”

Yung-Chen (Andrew) Wang, Ph.D.
Post-Doctoral Researcher
Medtronic

Contact Sachin Attavar by **April 13** to register.
sattavar@eag.com or 952-641-1246

Cost: $25 to cover the cost of your food and drink
Cash or check to MN-AVS board members onsite
**First 5 students to register pay only $5**
Quantitative Computational and Experimental Characterization of Functionalized Nanoparticles

Yung-Chen (Andrew) Wang, Ph.D.
Post-Doctoral Researcher, Medtronic

Abstract
Nanoparticles are widely used in many fields of science and can often be found in everyday commercial products. This widespread use of nanoparticles in our daily lives and the industry have raised several concerns regarding the safety and environmental impact of these nanoparticles. In the biomedical field, understanding how nanoparticles interact with the biological environment is crucial for public safety and advancing the development of nanomedicine. Here, both computational and experimental methods were developed to aid the surface chemical characterization of functionalized nanoparticles.

The major experimental project focuses on controlling and probing the orientation of immobilized proteins on gold nanoparticles. Protein G B1, a protein that will selectively bind to the Fc region of IgG, was immobilized onto gold NPs (AuNPs) functionalized with oligo(ethylene glycol)-Maleimide (OEG-MEG) self-assembled monolayers (SAMs). The orientation of the protein can be controlled via a site-specific maleimide-sulfhydryl reaction between the OEG-MEG SAMs and the cysteine amino acid in the protein. Utilizing site-specific chemistry and surface sensitive analysis techniques of X-ray photoelectron spectroscopy (XPS) and time-of-flight secondary ion mass spectrometry (ToF-SIMS), it was possible to both control and determine the orientation of immobilized Protein G B1 on gold nanoparticles.

In addition to experimental analysis, robust computer simulations using the Simulation of Electron Spectra for Surface Analysis (SESSA) program were incorporated to aid the characterization of a wide variety of nanoparticles. It was demonstrated that SESSA can accurately simulate XPS spectra and peak intensities of nanoparticles and verify existing methods of calculating overlayer thickness of core-shell nanoparticles. Further, SESSA can be applied to assess the structure and thickness of various SAMs on both flat and nanoparticle surfaces by incorporating experimentally collected XPS and sum-frequency generation (SFG) results.

Bio
Yung-Chen (Andrew) Wang was born in Taipei, Taiwan. He received his B.S. in Bioengineering from the University of California, Merced in 2012. He received his Ph.D. in Bioengineering from the University of Washington in 2017 under the advisement of Professor David Castner.