

# Topologically Nontrivial Properties and Interactions in Graphene-like Materials

**Abstract – Lilia M Woods, USF**

The expansion of the graphene family of materials by adding silicene, germanene, and stanene has created new opportunities for probing Dirac-like physics and nontrivial band topology. Due to the finite buckling and significant spin orbit interaction in these newly added materials, unique quantum Hall phase states have been predicted. In this presentation, I will show how external fields can be used to tune the electronic and Hall response in these honeycomb buckled layers. In this context, I will also discuss universal long-ranged fluctuation induced interactions, such as the Casimir force, which is responsible for sticktion and adhesion phenomena at the micrometer scale. Casimir force phase transitions are predicted with unusual features, such as repulsion and quantization. In addition to external fields, creating buckled bilayered structures can also be used for electronic structure modifications with new topologically non-trivial characteristics. The stacking and composition dependence of bilayers from the extended graphene family shows distinct differences from bilayer graphene configurations, which further broadens the impact of this rapidly expanding field. Emphasis on the basic science of these materials in terms of the development of modern analytical and computational tools will also be given.

**Short Bio:** Lilia M. Woods has obtained her PhD in Condensed Matter Physics from the University of Tennessee, Knoxville with Prof. Gerald D. Mahan as a PhD advisor. She has been a postdoc at Oak Ridge National Lab, followed by a second postdoc at the Naval Research Lab, where she has held the prestigious Director's funded NRC Fellowship. In 2003 she became an Assistant Professor at the University of South Florida and in 2012 she was promoted to Full Professor. Lilia M. Woods has established a vigorous research program in theoretical and computational condensed matter physics, which has been continuously funded by the National Science Foundation and the Department of Energy since 2006. She has been recognized by the USF Outstanding Research Achievement Award (twice) and by the Jewell Faculty Excellence Award. She is a member of the National Academy of Inventors. She is also an APS Woman Physicist of the month of June in 2017 and elected as an APS Fellow in 2017. She has also received the International Association of Advanced Materials Medal for 2018.