

# Department of Physics and Astronomy

## Colloquium



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**Date:** April 10, 2017

**Time:** 4:00 p.m. (**Refreshments** in **Rm. 103 @ 3:50 p.m.**)

**Place:** Rm. 103, Thirkield Hall, Howard University

**Host:** Dr. Thomas Searles

### **Nanophotonics 3.0: Attojoule Optoelectronics, Optical Information Processing and Photonic Compute-Engines**

**Abstract:** In nanophotonics we create optical material-systems, which are structured at length- scales smaller than the wavelength of light. When light propagates inside such sub-diffraction limited waveguide modes and cavities numerous novel and exciting physical phenomena emerge including unity-high index modulation, strong Purcell enhancement, and selective exciton- polariton modifications. However, in order to make use of these opportunities for real-world applications, one has to have the ability to integrate nanophotonic structures into functional devices, synergistic links and circuits. In this talk, I present some of our recent theoretical and experimental progress in exploring thresholdless lasing, attojoule-per-bit efficient modulators, and plasmonic and Soliton-based switching. Furthermore, I will show fundamental scaling laws of nanophotonic devices and derive a Figure-of-merit for optical information flow. Using the bosonic character of photons we develop in-the-network information processing engines. Here we map the computational algorithm onto the photonic hardware to demonstrate optical analogue compute engines based on residue arithmetic and neuromorphic computing.