



## Joint Quantum Sciences Seminar

**Wednesday, March 4, 4:00 pm**

**Jefferson 250**

**Vladimir M. Shalaev**

*Purdue University*

### **Merging Metamaterials with Quantum Photonics**

Over the past decade, one of the major focuses for the area of nanophotonics has been on developing a new class of “plasmonic” structures and “metamaterials” as potential building blocks for advanced optical technologies, including data processing, exchange and storage; a new generation of cheap, enhanced-sensitivity sensors; nanoscale-resolution imaging techniques; new concepts for energy conversion including improved solar cells, as well as novel types of light sources. Designing plasmonic metamaterials with versatile properties that can be tailored to fit almost any practical need promises a range of potential breakthroughs. However, to enable these new technologies based on plasmonics, grand limitations associated with the use of metals as constituent materials must be overcome. In the structures demonstrated so far, too much light is absorbed in the metals (such as silver and gold) commonly used in plasmonic metamaterials. The fabrication and integration of metal nanostructures with existing semiconductor technology is challenging, and the materials need to be more precisely tuned so that they possess the proper optical properties to enable the required functionality. Our recent research aims at developing new designs and plasmonic materials (other than the metals used so far) that will form the basis for future low-loss, durable, CMOS-compatible devices that could enable full-scale development of the plasmonic and metamaterial technologies. Can these recently developed plasmonic structures and metamaterials based on new material platforms help in unfolding the potential of quantum photonics? We report on our first efforts in that direction.

**Student Presentation by Alex High , will begin at 4:00 PM**

**Guest Presentation will begin at 4:30 PM**

**Refreshments will be provided**