

# Physics & Astronomy Colloquium

Presents

## Zhi-Gang Yu

Institute for Shock Physics, Washington State University

Tuesday, September 19, 2017

4:10 pm, Webster Room 17

### **“Spin-orbit coupling and optoelectronic properties in hybrid organic-inorganic perovskites”**

Hybrid organic-inorganic perovskites (HOIPs), such as  $\text{CH}_3\text{NH}_3\text{PbI}_3$ , represent a revolutionary breakthrough for low-cost solar cells. To date, the photovoltaic efficiency has exceeded 22% in solar cells made of solution-processed HOIPs. HOIPs have also shown great promise in solid-state lighting and other optoelectronic applications. The extraordinary optoelectronic performance in HOIPs is due to a fortuitous combination of desired optical response and carrier dynamics. A unique feature of the HOIPs is their colossal Rashba effect (RE), caused by strong spin-orbit coupling associated with the heavy atoms and the lack of inversion symmetry in their crystal structures. The RE breaks spin degeneracy in the conduction and valence bands, and shifts the band extrema from the Brillouin-zone center. In this talk, I will show that the colossal RE can manifest itself in carrier transport, electron-hole recombination, linear and nonlinear optical absorption, and exciton spin dynamics of HOIPs and is a key to understanding these important optoelectronic properties. These manifestations can also be exploited to quantify the RE in HOIPs.

*Please meet our guest speaker and share in refreshments,  
3:45-4:10 p.m. in the foyer on floor G above the lecture hall*

Host: Dr. Yogendra Gupta