

## **APS-U: Frontiers of Condensed Matter Physics**

May 20-21, 2015

Co-chairs: Oleg Shpyrko (UCSD) and John W. Freeland (APS)

The upgrade of Advanced Photon Source, based on Multi-Bend Achromat lattice, will feature unprecedented increases in brightness of x-ray beams available to APS users. This workshop's goal is to explore a broad range of the scientific questions that these new developments will help answer, specifically in the area of condensed matter and materials physics. The class of materials and phenomena to be explored by this workshop ranges from fundamental questions relevant to quantum materials, strongly correlated electronic or magnetic materials, topological materials, to ferroelectrics, ionic materials, glasses, etc. Of specific interest are the areas such as phase transitions (electronic, magnetic, structural), coupling between multiple degrees of freedom and their response to external stimuli, studies of in-situ, in-operando of devices or in-situ growth processes, the role of disorder and defects, the role of nanoscale fluctuations, intermittency and metastability that is the basis of the immense complexity of collective dynamics and structural properties that is the common quality of much of condensed matter physics.

### Agenda

#### **May 20, 2015**

8:30 am: Stephen Strieffer - Welcome, John Freeland and Oleg Shpyrko – Introduction & Charge

9:00 am: **Coherent X-ray Studies of Materials Synthesis**

G. Brian Stephenson – Materials Science Division, Argonne National Laboratory

9:30 am: **Opportunities at Oxide Interfaces: Using the Synchrotron to Open New Scientific Directions**

Steve May - Materials Science and Engineering, Drexel University

10:00 am: **TBA**

Chris Marianetti - Department of Applied Physics, Columbia University

10:30 Break

11:00 am: **XPCS: Beyond time correlations**

Mark Sutton – Department of Physics, McGill University

11:30 am: **Tracing spatiotemporal dynamics in flowing solids?**

Robert Maass - Materials Science and Engineering, Univ. of Illinois, Urbana

12:00 pm: **Let's make the synchrotron an indispensable tool for materials physics**

Rafael Jaramillo - Department of Materials Science and Engineering at Massachusetts Institute of Technology

12:30 pm Working lunch: Opportunities with the MBA upgrade of APS.  
Discussion leader: Oleg Shpyrko (UCSD)

1:30 pm: **Where have all the ions and electrons gone? The case for observations of heterogeneity as descriptors of function**

Jordi Cabana – Department of Chemistry, University of Illinois, Chicago

2:00 pm: **The dynamics of ordering processes in condensed matter: the past, present, and future**

Richard Averitt – Department of Physics, University of California, San Diego

2:30 pm: **Opportunities for probing topological phenomena out of equilibrium**

Greg Fiete – Department of Physics, University of Texas, Austin

3:00 pm Break

3:30 pm: **TBA**

Luc Patthey, Swiss Light Source, Paul Scherrer Institute

4:00 pm: **The unreasonable irrelevance of quantum mechanics in condensed matter physics (and what to do about it)**

N. Peter Armitage – Department of Physics and Astronomy, The Johns Hopkins University

4:30 pm: **Frontier Materials: Spin-Orbit Effects in Iridates**

Gang Cao - Department of Physics, University of Kentucky

5:00 pm Wrap-up

7:30 pm – Dinner

**May 21, 2015**

9:00 pm John Freeland & Oleg Shpyrko - Summary

9:30 Open session

10:30 Break

11:00-12:00 Document Review