



Laboratory for Neutron Scattering and Imaging Paul Scherrer Institute

Invitation for an LNS Seminar

- Date:** Tuesday, June 11, 2019, 10:30
- Location:** Paul Scherrer Institute, Area West, Bldg. **WHGA/121**
- Speaker:** Nicolas Gauthier, Stanford Institute for Materials and Energy Science, Stanford, USA

Exploring opportunities with spatially-resolved and time-resolved ARPES

Angle-resolved photoemission spectroscopy (ARPES) is a powerful technique to measure electronic band structures and Fermi surfaces. With energy and momentum resolution, it can reveal superconducting gaps and many-body correlations. Constant improvements provide new opportunities to study strongly correlated systems. In particular, I will present two ongoing ARPES projects that reveal new insights about quantum materials by exploiting, in one case, a small beam spot, and in the other case a pump-probe experiment.

While ARPES studies have been focusing on the quasi-2D materials, studies on 3D materials are limited due to the difficulty of obtaining flat surfaces required for well-defined momenta and the challenge of determining the out-of-plane momentum. I will present the special case of a 3D metal in which the use of a small beam spot allows to overcome these two effects. Cleaving this sample reveals microscopic flakes. The particular photoemission from such flakes is a great tool to reveal the dispersion perpendicular to the sample surface.

Time domain studies can also open new avenues for material science. In particular, optical excitation by ultrashort light pulses can generate coherent phonons. With time-resolved ARPES we can directly study how the band structure is affected by these coherent phonons through the electron-phonon coupling. We investigated a topological semi-metal using this approach and I will discuss what we can learn from this.