

## Aaron Bostwick, Ph.D., Physics

Years of Fellowship: 2005

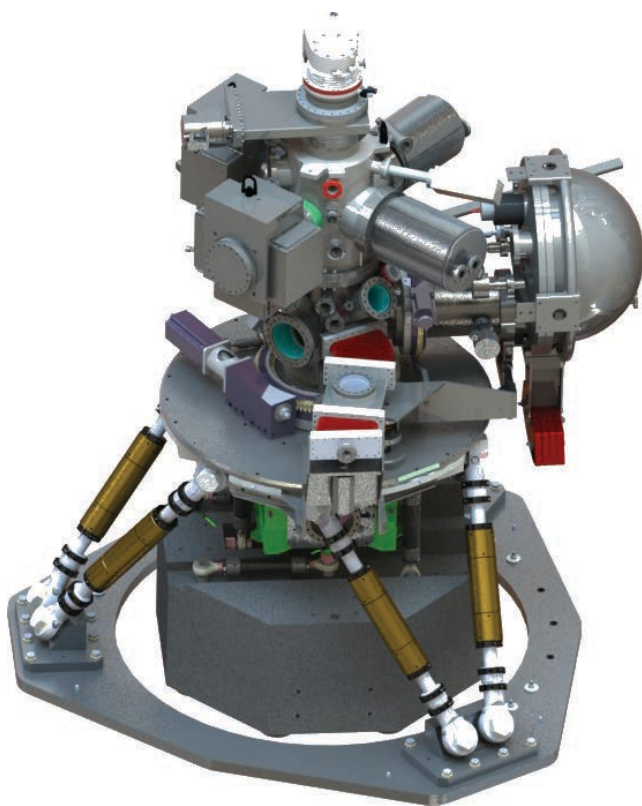
Collaborating Institution: Montana State University

Currently: Staff Scientist, Advanced Light Source

Project: **Development of NanoARPES technique**



Angle-resolved Photoemission Spectroscopy (ARPES) is the premier technique for understanding the fundamental properties of electrons and how they propagate in solids. The Advanced Light source is the world's leading user facility for ARPES, and has been a pioneer of the technique.



Aaron Bostwick came to the ALS in a joint appointment with Prof. Gerry Lapeyre of Montana State University to develop the nascent nanoARPES technique. In ARPES, advanced detectors are used to measure the momentum and energy of the emitted photoelectrons when synchrotron light shines on a sample. In NanoARPES, the synchrotron light is focused using a Fresnel Zone Plate to a nm-scale spot, allowing the spatial dependence of the electronic structure to be measured. At the beginning of this project, the viability of the technique was questionable. The project was initiated to test key concepts, such as the extent of space charge broadening on measured electronic energy resolution. Key hardware provided by Montana State was used to demonstrate that the technique would be viable and to generate interest in the project.

Based on early success, this project evolved into two laboratory directed research projects (LDRD) and eventually a \$4.95M single investigator, small-group-research (SISGR) proposal funded by the Materials Division of DOE, with an additional \$3M of DOE Facilities (AIP) funds. Under these proposals, new instruments were invented and a new beamline and endstation project was initiated. The new beamline is expected to be commissioned in 2013.

This research has stimulated worldwide interest in the technique, with active proposals or endstations being installed at SOLEIL (France), NSLS-II (USA), SRRC (Taiwan), ELETTRA (Italy), and SSRL (USA).

