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Senior Research and Development Staff
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Employment:

2020- Direct Geometry Group Leader, Spectroscopy Section, Neutron Scattering Division, ORNL
2019-2020 Direct Geometry Team Leader, Spectroscopy Group, Neutron Scattering Division, ORNL
2001- Point of Contact/Lead Instrument Scientist, ARCS instrument, Spallation Neutron Source, ORNL
2017-2019 Spectroscopy Group member, Neutron Scattering Division, ORNL
2012-2017 Time-of-flight Spectroscopy Group member, Quantum Condensed Matter Division, ORNL
2009-2011 Deputy Group Leader, Time-of-Flight Inelastic Group, ORNL Neutron Scattering Science Division
1998-2001 Instrument Scientist, SNS, ORNL
1993-1998 Staff scientist, European Synchrotron Radiation Facility, Grenoble France
1993 Postdoctoral Fellow, Physics Department, Massachusetts Institute of Technology, Cambridge MA
1984-1987 Senior Technical Associate, AT&T Bell Laboratories, Murray Hill NJ

Education:

1987-1993 Massachusetts Institute of Technology, Cambridge, MA
Ph.D., Physics, May 1993
Thesis: *An X-Ray Scattering Study of the Si(113) Surface: Atomic Structure and Phase Transformation*
Thesis advisor: Professor S. G. J. Mochrie

1980-1984 Amherst College, Amherst, MA
B.A., Physics and Mathematics, May 1984

Professional Experience:

Direct Geometry Group/Team Leader, Spectroscopy, ORNL (2019 – present)

- Provide line-management for Direct Geometry group scientists and post-docs, including work planning and performance evaluations.
- Coordinate activities of the Direct Geometry group for common scientific or technical projects.
- Assist the Spectroscopy Section leader as needed. Maintain awareness of group status and needs and provide feedback to the section leader about common issues or concerns. Help coordinate section highlights.

Point of Contact/Lead Scientist for the ARCS Instrument at the SNS (2001 – present)

- Responsible for the operation of ARCS, a direct geometry chopper spectrometer for inelastic neutron scattering studies at the Spallation Neutron Source. Direct the continued development of the instrument hardware, controls and data reduction software. Oversee the instrument user program, including experiment scheduling and planning. Provide guidance to staff instrument scientist, scientific associate and post-docs.
- Pursue research utilizing inelastic scattering to study excitations in condensed matter systems, including the study of phonons in thermoelectric materials, novel lattice dynamical behavior, and magnetic interactions.
- Project Manager for the \$12.3M hardware portion of the ARCS project. Responsible for establishing cost and schedule baselines, tracking project progress and reporting to SNS and the US Department of Energy. Appointed a non-resident Faculty Associate at the California Institute of Technology (2001-2007) to monitor the financial status of the ARCS grant.

Deputy Group Leader, TOF Inelastic Group, ORNL (2009 – 2011)

- Assist group leader in organizing and/or attending appropriate meetings, such as the monthly group meeting and division management meetings as needed. Maintain awareness of group status and needs and provide feedback to the group leader about common issues or concerns. Coordinate group highlights and monthly metrics for management.

SNS Instrument Scientist for Chopper Spectrometers (1998-2001)

- Developed instrument concepts for direct geometry spectrometers at the SNS, including analytical and Monte Carlo simulation of performance. Proposed co-optimization of a wide-angle and a high-resolution chopper spectrometer to maximize scientific impact of early instruments at SNS.
- Scientific advisor for the SNS Chopper group to specify and develop different neutron chopper devices. Participated in discussions leading to the SNS timing scheme to smooth pulse-to-pulse variations to minimize data loss from phase locking problems with choppers.

Staff Scientist at the European Synchrotron Radiation Facility (1993-1998)

- Second scientist for the Troika beamline, a multi-purpose, multi-station instrument using undulator x-ray radiation for a wide range of experiments. Responsible for user interactions, from experiment pre-planning to final data handling and analysis.
- Developed hardware and software for X-ray photon correlation spectroscopy, a technique which uses the coherent nature of undulator radiation to probe the equilibrium fluctuations in a sample. Developed micron sized apertures and software applications to analyze CCD camera speckle patterns.

Post-doc and research associate at MIT (1987-1993)

- Developed an ultra-high-vacuum surface x-ray diffraction chamber with integrated six-circle diffractometer to do studies of surface phase transitions at the National Synchrotron Light Source, Brookhaven National Laboratory. Extended instrument control software to use the diffractometer degrees of freedom to specify incident or exit angles from the sample surface.

Senior technical associate at Bell Laboratories (1984-1987)

- Designed and constructed a control system for a novel backscattering monochromator and analyzer system for use at the High Flux Beam Reactor at Brookhaven National Laboratory.

Awards:

- 2019 SNS/HFIR User Group Award for Excellence in Beam Line Science
- 2011 Team member for the Gordon Battelle Prizes for Scientific Discovery and Technology Impact for research on iron-based superconductors (PI: Mark Lumsden)

Professional Service:

- Member of the Neutron Scattering Society of America, American Physical Society
- Member of the Scientific Working Group for the Mantid software project since 2021.
- Intense Pulsed Neutron Source Program Advisory Committee, Inelastic Scattering Subcommittee, Argonne National Laboratory, 2004-2007
- Independent Investigator Proposal Review Committee, SRI-CAT, Advanced Photon Source, Argonne National Laboratory, 1999-2001

Selected Recent Publications:

1. X. Y. Li, H. P. Zhang, S. Lan, D. L. Abernathy, T. Otomo, F. Wang, Y. Ren, M. Z. Li, X. L. Wang, "Observation of High-Frequency Transverse Phonons in Metallic Glasses." *Physical Review Letters* **124**, 225902 (2020).
2. M. E. Manley, P. Stonaha, D. L. Abernathy, S. X. Chi, R. Sahul, R. P. Hermann, J. D. Budai, "Supersonic propagation of lattice energy by phasons in fresnoite." *Nature Communications* **9**, 1823 (May 2018).
3. H. Smith, C. W. Li, A. Hoff, G. R. Garrett, D. S. Kim, F. C. Yang, M. S. Lucas, T. Swan-Wood, J. Y. Lin, M. B. Stone, D. L. Abernathy, M. D. Demetriou, B. Fultz, "Separating the configurational and vibrational entropy contributions in metallic glasses," *Nature Physics*, (2017).
4. D. L. Abernathy, M. B. Stone, M. J. Loguillo, M. S. Lucas, O. Delaire, X. Tang, J. Y. Y. Lin, and B. Fultz, "Design and operation of the wide angular-range chopper spectrometer

ARCS at the Spallation Neutron Source,” *Review of Scientific Instruments* **83**, 15114 (2012).