

## Michael Scott Pierce

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### CONTACT INFORMATION

Materials Science Division  
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### RESEARCH INTERESTS

Experimental Condensed Matter Physics : Nanoscale Materials, Surfaces, Interfaces, and Magnetism studied both with traditional x-ray diffraction, coherent scattering, and direct surface microscopy.

### PERSONAL

Born March 31st, 1975  
United States Citizen  
Married to Kerri Alisa Pierce

### EDUCATION

**University of Washington**, Seattle Washington, USA

Ph.D. Physics 2006  
*X-ray Speckle Experiments on the Persistence and Disintegration of Magnetic Memory*  
Advisor: Prof. Larry B. Sorensen

**University of Washington**, Seattle Washington, USA

M.S. Physics 2002

**Rensselaer Polytechnic Institute**, Troy New York, USA

B.S. Physics 1998  
*Magna cum laude*

### HONORS AND AWARDS

- 2007 Henderson Prize for outstanding Physics PhD thesis, University of Washington
- Thesis research selected for Advanced Light Source at Berkeley National Lab science highlight for 2005
- Thesis research selected for Advanced Light Source at Berkeley National Lab science highlight for 2003
- 1998 G. Howard Carragan Award (RPI)
- 1998 APS Apker Award Nominee for RPI
- Graduated Magna Cum Laude (RPI)
- Completed Honors Program, Amarillo College 1995

### POSTDOCTORAL RESEARCH

Argonne National Laboratory  
Materials Science Division  
Advisor: Dr. Hoydoo You  
mid 2006 — Present

I currently work in the Materials Science Division at Argonne National Laboratory under the guidance of Dr. Hoydoo You in the Synchrotron Radiation Studies group. We study the structure and character of novel materials using modern x-ray sources such as the Advanced Photon Source. Our primary research interests are surface and interface science, nanomaterials, and electrocatalysis in support of environmental science. Currently, we are developing coherent surface diffraction techniques to explore dynamic phenomena at surfaces and interfaces. We have previously studied the

reconstruction of gold atoms from room temperature to near the bulk melting point in different gaseous and electrochemical environments. I have also been studying the properties of Au and Pt nanoparticles on metal-oxide substrates such as MgO and TiO<sub>2</sub>. I have also been fortunate to be able to continue some of my thesis research in magnetism and coherent x-ray scattering.

#### PHD THESIS

University of Washington  
Experimental Condensed Matter Physics  
Advisor: Professor Larry B. Sorensen  
2001— mid 2006

My thesis work has centered around using coherent x-ray scattering experiments to study thin magnetic films. First we demonstrated the use of coherent soft x-ray scattering as a way to study the microscopic magnetic properties of perpendicular magnetic films. The experiment worked so well that we went on to apply it to study the effects of disorder on the memory properties of a series of technologically important Co:Pt films. What we found surprised us and conflicted with predictions from current models of magnetic hysteresis. We then proceeded to work with several leading theorists to formulate possible explanations for our observed results.

#### UNDERGRADUATE RESEARCH

Rensselaer Polytechnic Institute  
Theoretical Nuclear Physics  
Advisor: Professor Nimai C. Mukhopadhyay(deceased)  
1996-1998

My undergraduate research involved the study of Delta(1232) resonance in photon-nucleon interactions. I used an Effective Lagrangian model developed by R.M. Davidson and N.C. Mukhopadhyay to study the photon-nucleon scattering process at the Delta resonance to extract the electric quadrupole (E2) and magnetic dipole (M1) amplitudes from existing data. Precise determination of the amplitudes was our primary goal such that predictions from theoretical models of nuclear physics could be tested.

University of Texas  
Experimental Plasma Physics  
PI: Professor Alan J. Wootton  
Summer 1997

I worked on a project to build a linear plasma device for the study of instabilities and turbulent flows in plasmas for the Fusion Research Center at the University of Texas.

#### TEACHING EXPERIENCE

**Physics by Inquiry based teaching** : While a graduate student at the University of Washington, I was a teaching assistant for several undergraduate courses which incorporated inquiry based instruction. This approach has been shown to be highly effective at not only conveying facts, but also at imparting scientific principles and reasoning. By directly engaging the students, the students are encouraged to develop physical ideas, interpret observations and construct explanatory models. These models are then tested and revised during instruction. As a part of my graduate education, I also participated in several physics education seminars and tutorial classes whose focus was upon improving instruction. I think that technology can play an increasingly beneficial role in teaching science. Lectures which promote active learning (through such things as "clickers"), graphical computer simulations where students are able to explore subjects, and online discussion through class forums all can be beneficial to student learning and offer distinct advantages over the traditional physics lecture format. I think our understanding of how best to teach science to students is rapidly evolving and I think that a

responsible teacher must stay current with this information and be ready to incorporate new methods and ideas when they are confirmed and accessible.

2003 Teaching Assistant (UW)

Physics 431, Modern Experimental Physics Lab

Physics 434, Interfacing Computers and Experiments

2002 Teaching Assistant (UW)

Physics 431, Modern Experimental Physics Lab

1999-2001 Teaching Assistant (UW)

Physics 117,118,119 Freshman Physics

Physics 131,132,133 Freshman Physics

1997 Teaching Assistant (RPI)

Junior Experimental Physics Lab

## PUBLICATIONS

- M.S. Pierce, K.C. Chang, D. Hennessy, V. Komanicky, A. Sandy, M. Sprung, and Hoydoo You. *Coherent surface diffraction: X-ray speckles from the Au (001) surface monolayer reconstruction..* Physical Review Letters, Accepted September (2009)
- M.S. Pierce, K.C. Chang, D. Hennessy, V. Komanicky, A. Menzel, and Hoydoo You. *CO-Induced lifting of the Au(001) surface reconstruction.* **Letter:** Journal of Physical Chemistry C, **112** 2231-2234 (2008).
- D. Hennessy, M.S. Pierce, K.C. Chang, S. Takakusagi, H. You, and K. Uosaki. *Hydrophilicity Transition of the rutile TiO<sub>2</sub> (110) surface.* Electrochimica Acta, **53**, 6173 (2008).
- M.S. Pierce, C.R. Buechler, L.B. Sorensen, S.D. Kevan, E.A. Jagla, J.M. Deutsch, T. Mai, O. Narayan, J.E. Davies, K. Liu, G.T. Zimanyi, H.G. Katzberger, O. Hellwig, E.E. Fullerton, and J.B. Kortright. *“Disorder induced magnetic memory: Experiments and theories.”* Physical Review B, **75**, 144406 (2007).
- M.S. Pierce, C.R. Buechler, L.B. Sorensen, S.D. Kevan. *“The Persistence of Memory: Disorder-Induced Microscopic Magnetic Memory.”* Advanced Light Source at Lawrence Berkeley Lab science highlight for 2005.
- M.S. Pierce, C.R. Buechler, L.B. Sorensen, J.J. Turner, S.D. Kevan, E.A. Jagla, J.M. Deutsch, T. Mai, O. Narayan, J.E. Davies, K. Liu, J. Hunter Dunn, K.M. Chesnel, J.B. Kortright, O. Hellwig, and E. E. Fullerton. *“Disorder-induced microscopic magnetic memory.”* Physical Review Letters **94**, 017202 (2005).
- M.S. Pierce, R.G. Moore, P. Geissbuhler, L.B. Sorensen, S.D. Kevan, J.B. Kortright, O. Hellwig, and E.E. Fullerton. *“Learning how magnets forget.”* Advanced Light Source at Lawrence Berkeley Lab science highlight for 2003.
- M.S. Pierce, R.G. Moore, L.B. Sorensen, S.D. Kevan, J.B. Kortright, O. Hellwig, and E.E. Fullerton. *“Quasistatic x-ray speckle metrology of microscopic magnetic return point memory.”* Physical Review Letters **90**, 175502 (2003).
- R.M. Davidson, Nimai C. Mukhopadhyay, M.S. Pierce, R.A. Arndt, I.I. Strakovsky, R. L. Workman. *“Problems with Extraction of the Nucleon to Delta(1232) Photonic Amplitudes.”* Physical Review C **59**, 1059 (1999).
- PhD Thesis 2006 (UW) *“X-ray Speckle Experiments on the Persistence and Disintegration of Magnetic Memory”* Advisor: Professor Larry B. Sorensen.
- Senior Thesis 1998 (RPI) *“Importance of Double Polarization Observables in the Study of the Delta(1232) Resonance Using Real Photons.”* Advisor: Professor Nimai C. Mukhopadhyay.

### Publication Summary

3	Physical Review Letters
1	Electrochemica Acta
1	Journal of Physical Chemistry C
1	Physical Review B
1	Physical Review C
2	Unrefereed publications
1	PhD Thesis
1	Undergraduate Thesis

#### PAPERS IN PREPARATION

- M.S. Pierce, K.C. Chang, D. Hennessy, V. Komanicky, A. Sandy, M. Sprung, and Hoydoo You. *Coherent surface scattering studies of the Pt (001) and Au (001) surface reconstructions in vacuum..* In preparation for submission to Physical Review B.
- M.S. Pierce, K.C. Chang, D. Hennessy, V. Komanicky, A. Menzel, and Hoydoo You. *In-situ X-ray scattering studies of the Au (001) surface reconstruction during CO oxidation.* In preparation for submission to Physical Review B.
- M.S. Pierce, C.R. Buechler, L.B. Sorensen, J.J. Turner, S.D. Kevan, E.A. Jagla, J.B. Kortright, J.E. Davies, K. Liu, O. Hellwig, and E.E. Fullerton. *“Hysteresis, disorder, and the evolution of magnetic domains in Co:Pt thin films.”* In preparation for submission to Physical Review B.

#### RESEARCH SEMINARS, TALKS, AND INVITED PRESENTATIONS

- *Coherent X-ray Surface Diffraction: A new tool for surface science demonstrated on the Au (001) and Pt (001) surface reconstructions.*, Post-doctoral Research Symposium, Argonne National Laboratory, September 10th 2009
- *Surface X-ray Speckles: Coherent Scattering from the Au (001) and Pt (001) surfaces*, Gordon Research Conference (X-ray Science), Colby College, Maine, August 4th 2009
- *Surface Speckles : Coherent x-ray scattering from hex reconstructions of Au and Pt surfaces*, Surface and Interface Interest Group, Advanced Photon Source, July 21st, 2009
- *Coherent X-ray Surface Diffraction : Speckle from the surface layer of gold*, American Physical Society March Meeting, Pittsburgh March 16th, 2009.
- *Au Surface Studies : CO interaction with the Au(001) Surface Reconstruction and Coherent Surface Diffraction*, Surface and Interface Interest Group, Advanced Photon Source, September 16th, 2008
- *Au surface studies : diffuse and coherent scattering*, Post-doctoral Research Symposium, Argonne National Lab, September 11th, 2008
- *CO and the Au(001) Surface Reconstruction*, Catalysis Science Group-APS, Advanced Photon Source, June 10th, 2008
- *Questioning the Nobility of Gold : CO and the Au(001) Surface Reconstruction : Pressure and Temperature Effects*, Catalysis Club of Chicago Spring Symposium, May 15th, 2008
- *Questioning the Nobility of Gold : CO and the Au(001) Surface Reconstruction Pressure and Temperature Effects*, Penn. State University, November 9th, 2007
- *Questioning Nobility : CO and the Au (001) surface reconstruction*, 2007 PEC Conference, University of Illinois Urbana-Champaign, June 20th, 2007
- *Disorder and Hysteresis.* University of Wisconsin Free-Electron-Laser workshop, magnetism focus group. University of Wisconsin, Madison, June 18th, 2007
- *Study of the influence of disorder on magnetic memory using coherent x-rays*, XSD-APS, Argonne National Laboratory, April 3rd, 2007

- *Persistence and Disintegration of Memory*, Materials Science Division, Argonne National Laboratory, January 13th, 2006
- *Persistence and Disintegration of Memory*, Spallation Neutron Source, Oak Ridge National Laboratory, January 6th, 2006
- *Persistence and Disintegration of Memory*, LANSCE Lujan Seminar Series, Los Alamos National Laboratory, December 15th, 2005
- *Persistence of Magnetic Memory*, University of Washington Physics—CDO Networking Day, November 1st, 2005
- *The Persistence of Memory*, University of Puget Sound, November 19th, 2004
- *New Lessons from Speckle Studies of Disordered Magnets*, Annual Advanced Light Source—Lawrence Berkeley National Laboratory Users Meeting, October 19th, 2004

PROFESSIONAL  
SERVICE

Referee for *New Journal of Physics*

Referee for *Review of Scientific Instruments*

Colloquium Committee, ANL Materials Science Division

Member of American Physical Society and American Chemical Society

OTHER ACTIVITIES

- Participant in the online science outreach program **ANL-Newton Ask a Scientist**.  
<http://www.newton.dep.anl.gov/aas.htm>
- Participant (and occasional organizer) of the UW Condensed Matter Physics Journal Club, 2001—2005.
- Computer Operating Systems(fluent): Macintosh (OsX, Os9), RedHat x86 Linux (6.x,7.x,8,9), Fedora Core x64 Linux (3,4,5), Yellowdog PPC Linux (2.x,3), IBM OS/2, MS Windows.
- Computer Programming Skills(fluent): C/C++, Cocoa, Fortran, Visual Basic(prior to .Net), Matlab.
- Experimental Interfacing Skills: Spec, EPICS, Labview, GPIB, direct serial RS(various standards).
- Track and Road Bicycle Racing, Category 3 USCF Road and Track Racer 2000-2005.
- Collegiate Bicycle Road Racing, Mens A Category(UW), NCCA 2000-2002.
- Instructor for track bicycle racing classes at Marymoor Velodrome, Redmond WA 2003-2005.
- Functional knowledge of the German language, though not fluent. Wenn nur mein Deutsch doch besser wäre. Na ja.
- Amateur jazz guitarist.
- A love of amateur science and astronomy.