

## Hillary L. Smith

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### Current Position

**Swarthmore College**  
*Assistant Professor of Physics*

Swarthmore, PA  
*August 2018 - Present*

### Education

**California Institute of Technology**  
*Doctor of Philosophy in Materials Science*

Pasadena, CA  
*June 2014*

National Science Foundation Graduate Research Fellowship 2008-2011

**Bryn Mawr College**  
*Bachelor of Arts in Physics, Bachelor of Arts in Chemistry*

Bryn Mawr, PA  
*May 2006*

Graduated *magna cum laude* with honors in physics and chemistry

### Research Experience

- 3/2018 - 6/2018** Visiting Scientist, Australian Center for Neutron Research, Australian Nuclear Science and Technology Organisation (ANSTO), Sydney, Australia
- 9/2015 - 7/2018** Senior Researcher, Applied Physics and Materials Science Department, California Institute of Technology
- 4/2015 - 9/2015** Senior Scientist, Liox Power, Pasadena, CA
- 6/2014 - 4/2015** Postdoctoral Researcher, Applied Physics and Materials Science Department, California Institute of Technology
- 9/2008 - 6/2014** Graduate Research Assistant, Applied Physics and Materials Science Department, California Institute of Technology
- 6/2006 - 8/2008** Scientific Associate, Los Alamos Neutron Science Center, Los Alamos National Laboratory
- 8/2005 - 5/2006** Research Student, Chemistry Department, Bryn Mawr College

### Publications

*h-factor = 15 as of 6/1/20*

30. S.H. Lohaus, M.B. Johnson, P.F. Ahnn, C.N. Saunders, **H.L. Smith**, M.A. White, B. Fultz, "Thermodynamic stability and contributions to the Gibbs free energy of nanocrystalline Ni<sub>3</sub>Fe," *Physical Review Materials*, **4** 086002 (2020).
29. J. Lin, F. Islam, G. Sala, I. Lumsden, **H.L. Smith**, M. Doucet, M.B. Stone, D. Abernathy, G. Ehlers, A. J. Ankner, G. Granroth, "Recent developments of MCViNE and its applications at SNS," *Journal of Physics Communications* **3** 085005 (2019).
28. **H.L. Smith**, Y. Shen, D.S. Kim, F.C. Yang, C.P. Adams, C.W. Li, D.L. Abernathy, M.B. Stone, B. Fultz, "The temperature dependence of phonons in FeGe<sub>2</sub>," *Physical Review Materials* **2** 103602 (2018).

27. F.C. Yang, O. Hellman, M.S. Lucas, **H.L. Smith**, C.N. Saunders, Y. Xiao, P. Chow, B. Fultz, "Temperature dependence of phonons in Pd<sub>3</sub>Fe through the Curie temperature," *Physical Review B* **98** 024301 (2018).
26. G.E. Granroth, K. An, **H.L. Smith**, P. Whitfield, J. Neufeind, J. Lee, W. Zhou, V.N. Sedov, P.F. Peterson, A. Parizzi, H. Skorpenske, S.M. Hartman, A. Huq, D.L. Abernathy, "Event-based processing of neutron scattering data at the Spallation Neutron Source," *Journal of Applied Crystallography*, **51** 616 (2018).
25. D.S. Kim, O. Hellman, J. Herriman, **H.L. Smith**, J.Y.Y. Lin, N. Shulumba, J.L. Niedziela, C.W. Li, D. Abernathy, B. Fultz, "Nuclear quantum effect with pure anharmonicity and the anomalous thermal expansion of silicon," *Proceedings of the National Academy of Sciences*, **115** 1992 (2018).
24. J.L. Niedziela, R. Mills, M.L. Loquillo, H.D. Skorpenske, D. Armitage, **H.L. Smith**, J.Y.Y. Lin, M.S. Lucas, M.B. Stone, D. Abernathy, "Design and operating characteristic of a vacuum furnace for time-of-flight inelastic neutron scattering measurements," *Review of Scientific Instruments*, **88** 105116 (2017).
23. **H.L. Smith**, C.W. Li, A. Hoff, G. Garrett, D.S. Kim, F.C. Yang, M.S. Lucas, T. Swan-Wood, J.Y.Y. Lin, M.B. Stone, D. Abernathy, M. Demetriou, B. Fultz, "Separating the configurational and vibrational entropy contributions in metallic glasses," *Nature Physics*, **13** 900 (2017).
22. Y. Shen, C.W. Li, X. Tang, **H.L. Smith**, B. Fultz, "Phonon Anharmonicity and Components of the Entropy in Palladium and Platinum," *Physical Review B* **93** 214303 (2016).
21. S.J. Tracy, L. Mauger, **H.L. Smith**, H.J. Tan, J.E. Herriman, Y.M. Ziao, B. Fultz, "Polaron Mobility and Disorder of the Sodium Sublattice in Triphylite-Na<sub>x</sub>FePO<sub>4</sub>," *Chemistry of Materials* **28** 3051 (2016).
20. J.Y.Y. Lin, **H.L. Smith**, G.E. Granroth, D.L. Abernathy, M.D. Lumsden, B. Winn, A.A. Aczel, M. Aivazis, B. Fultz, "Monte Carlo Neutron Ray Tracing Simulation of Multiple Scattering and Multi-Excitation Scattering," *Nuclear Instruments and Methods A* **810** 86 (2016).
19. E. Talaie, V. Duffort, **H.L. Smith**, B. Fultz, L.F. Nazar, "Structure of the High Voltage Phase of Layered P2-Na<sub>x</sub>[Mn<sub>1/2</sub>Fe<sub>1/2</sub>]O<sub>2</sub> and the Positive Effect of Ni Substitution on its Stability," *Energy & Environmental Science* **8** 2512 (2015).
18. T. Lan, C.W. Li, O. Hellman, J.A. Munoz, **H.L. Smith**, D.L. Abernathy, B. Fultz, "Phonon quarticity induced by lattice expansion, and the stabilization of rutile TiO<sub>2</sub>," *Physical Review B* **92** 054304 (2015).
17. C.W. Li, **H.L. Smith**, T. Lan, J.L. Niedziela, J.A. Munoz, J.B. Keith, L. Mauger, D. Abernathy, B. Fultz, "Phonon Anharmonicity of Monoclinic and Yttrium-Stabilized Zirconia," *Physical Review B* **91** 144302 (2015).
16. A. Junghans, E.B. Watkins, R.D. Barker, S. Singh, M.J. Waltman, **H.L. Smith**, L. Pocivavsek, J. Majewski, "Analysis of biosurfaces by neutron reflectometry: From simple to complex interfaces," *Biointerphases* 10(1), 019014 (2015).
15. D.S. Kim, **H.L. Smith**, J.L. Niedziela, C.W. Li, D. Abernathy, B. Fultz, "Phonon Anharmonicity in Silicon from 100 to 1500K," *Physical Review B* **91** 014307 (2014).
14. T. Lan, C.W. Li, J.L. Niedziela, **H.L. Smith**, D.L. Abernathy, G.R. Rossman, B. Fultz, "Anharmonic Lattice Dynamics of Cuprite Ag<sub>2</sub>O Studied by Inelastic Neutron Scattering and First Principles Molecular Dynamics Simulations," *Physical Review B* **89** 054306 (2014).

13. H.J. Tan, **H.L. Smith**, L. Kim, T.K. Harding, S.C. Jones, B. Fultz, "Electrochemical Cycling and Lithium Insertion in Nanostructured FeF<sub>3</sub> Cathodes," *Journal of the Electrochemical Society* **161** (3) A1 (2014).
12. D.G. Abrecht, J.A. Munoz, **H.L. Smith**, B.Fultz, "Spin-State Effects on the Thermal Dihydrogen Release from Solid-State [MH( $\eta^2$ -H<sub>2</sub>dppe)<sub>2</sub>]<sup>+</sup> (M = Fe, Ru, Os) Organometallic Complexes for Hydrogen Storage Applications," *Journal of Physical Chemistry* (118) 1783 (2014).
11. A. Junghans, M.J. Waltman, **H.L. Smith**, L. Pocivacek, N. Zebda, K. Birukov, M. Viapiano, J. Majewski, "Understanding Dynamic Changes in Live Cell Adhesion with Neutron Reflectometry," *Modern Physics Letters B* **28** 1430015 (2014).
10. \***H.L. Smith**, B.C. Hornbuckle, L. Mauger, B. Fu, S. Tracy, G.B. Thompson, M.S. Lucas, Y.Xiao, M.Y. Hu, J. Zhao, E. Ercan Alp, B. Fultz, "Changes in Vibrational Entropy During the Early Stages of Chemical Unmixing in fcc Cu-6%Fe," *Acta Materialia* **61** 7466 (2013).
9. M.S. Jablin, M. Zherenkov, B.P. Toperverg, M. Dubey, **H.L. Smith**, A. Vidyasagar, R. Toomey, A.J. Hurd, J. Majewski, "In-Plane Correlations in a Polymer-Supported Lipid Membrane Measured by Off-Specular Neutron Scattering," *Physical Review B* **106** 138101 (2011).
8. **H.L. Smith**, J. Hickey, M.S. Jablin, A. Trujillo, J.P. Freyer, J. Majewski, "Mouse Fibroblast Cell Adhesion Studied by Neutron Reflectometry," *Biophysical Journal* **98** 793 (2010).
7. M. Hirayama, M. Yonemura, K. Suzuki, N. Torikai, **H.L. Smith**, E. Watkins, J. Majewski, R. Kanno, "Surface Characterization of LiFePO<sub>4</sub> Epitaxial Thin Films by X-Ray/Neutron Reflectometry," *Electrochemistry* **78** 413 (2010).
6. **H.L. Smith**, R.L. Usala, E.W. McQueen, J.I. Goldsmith, "Novel Polyaromatic-Terminated Transition Metal Complexes for the Functionalization of Carbon Surfaces," *Langmuir* **26** 3341 (2010).
5. M. Dubey, M.S. Jablin, **H.L. Smith**, J. Majewski, "Investigations of Surrogate Cellular Membranes Using Neutron Reflectometry," *Acta Crystallographica D* **66** 1237 (2010).
4. **H.L. Smith**, M.S. Jablin, A. Vidyasagar, J. Saiz, E. Watkins, R. Toomey, A.J. Hurd, J. Majewski, "Model Lipid Membranes on a Tunable Polymer Cushion," *Physical Review Letters* **102** 228102 (2009).
3. L. He, **H.L. Smith**, J. Majewski, C.Y. Fujimoto, C.J. Cornelius, D. Perahia, "Interfacial Effects on Water Penetration into Ultrathin Ionomer Films: An in-situ Study Using Neutron Reflectometry," *Macromolecules* **42** 5745 (2009).
2. A. Vidyasagar, **H.L. Smith**, J. Majewski, R.G. Toomey, "Continuous and Discontinuous Volume-Phase Transitions in Surface-Tethered, Photo-Crosslinked poly(*N*-isopropylacrylamide) Networks," *Soft Matter*, **5** 4733 (2009).
1. **H.L. Smith**, M.C. Howland, A.W. Szmodis, Q. Li, L.L. Daemen, A.N. Parikh, J. Majewski, "Early Stages of Oxidative Stress-Induced Membrane Permeabilization: A Neutron Reflectometry Study," *Journal of the American Chemical Society*, **131** 3631 (2009).

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\*Received the 2013 Acta Materialia Student Award

## Contributed and Invited Talks

21. “Vibrational Entropy of Glass Transitions in Metallic and Molecular Glasses,” American Conference on Neutron Scattering, Virtual Meeting (15 July 2020).
20. “Comparison of Excess Entropy in Strong and Fragile Metallic Glasses,” TMS Meeting, San Diego, CA (26 February 2020). *Invited*
19. “Using inelastic neutron scattering to determine the origin of specific heat at the glass transition,” NSTLI Seminar Series, Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW, Australia (2 May 2018). *Invited*
18. “Vibrational and Configurational Entropy of Liquids and Glasses,” APS March Meeting, Los Angeles, CA (8 March 2018).
17. “Entropy Contributions in Strong and Fragile Metallic Glasses,” TMS Meeting, San Diego, CA (1 March 2017).
16. “Investigations of Materials to Address Alternative Energy Challenges,” Department of Physics, Bryn Mawr College, Bryn Mawr, PA (23 January 2017). *Invited*
15. “Assessing the Role of Vibrational Entropy in Glasses,” American Conference on Neutron Scattering, Knoxville, TN (13 July 2016).
14. “Experiment Simulations in a High-Temperature Sample Environment,” American Conference on Neutron Scattering, Knoxville, TN (12 July 2016).
13. “Vibrational Entropies of Liquids and Glasses,” TMS Meeting, Nashville, TN (16 February 2016). *Invited*
12. “Comparison of the Entropy in  $\text{Cu}_{50}\text{Zr}_{50}$  and  $\text{Cu}_{46}\text{Zr}_{46}\text{Al}_8$ ,” TMS Meeting, Nashville, TN (18 February 2016).
11. “Study of Real-time Kinetic Phenomena with Inelastic Neutron Scattering,” SNS/HFIR User Group Meeting, Oak Ridge National Lab, Oak Ridge, TN (27 October 2015). *Invited*
10. “Configurational and Vibrational Entropy in Amorphous Copper Zirconium,” TMS Meeting, Orlando, FL (17 March 2015).
9. “Entropy and Metallic Glasses,” Department of Physics, Pomona College, Pomona, CA (29 January 2015). *Invited*
8. “Contributions from Configurational and Vibrational Entropy in Glassy CuZr,” American Conference on Neutron Scattering, Knoxville, TN (June 2014).
7. “High-Temperature Sample Environment Template for Experiment Simulations on DGS Instruments at the SNS”, American Conference on Neutron Scattering, Knoxville, TN (June 2014).
6. “Changes in Vibrational Entropy in Cu-Fe,” TMS Meeting, San Diego, CA (February 2014).
5. “Investigation of Electrochemical and Structural Changes During Discharge of Iron Trifluoride,” 10th Pacific Rim Conference on Ceramic and Glass Technology, San Diego, CA (June 2013).
4. *Phonons in Amorphous Copper Zirconium*, American Conference on Neutron Scattering, Washington, DC (June 2012)
3. “Vibrational Entropy of Amorphous Copper Zirconium,” TMS Meeting, Orlando, FL (March 2012).

2. “Neutron Reflectometry: From Model Biomembranes to Living Cells,” American Conference on Neutron Scattering, Ottawa, CN (June 2010).
1. “Five Inexpensive Ways to Involve More Women in Physics,” American Association of Physics Teachers, Anchorage, AK (March 2006).

## Undergraduate Research Supervision

Elena Lee (Swarthmore '23)	Summer 2020
Dylan Torrance (Swarthmore '22)	Summer 2020
Lucy Decker (Swarthmore '21)	Summer 2020, Research for Credit Spring 2020, Research Assistant Fall 2019, Summer 2019
Iris Wang (Swarthmore '21)	Summer 2019
Alexandria Rensing (Swarthmore '21)	Summer 2019, Research Assistant Fall 2019
Miriam Stein (Swarthmore '20)	Summer 2019
Ariel Hasse (Caltech '20)	Summer 2017, Fall 2017
Aadith Moorthy (Caltech '18)	Summer 2016
Carla Watson (Caltech '15)	Fall 2014, Spring 2015
Connie Hsueh (Caltech '15)	Summer 2013
Nick Parker (Caltech '14)	Summer 2012
Laura Kim (Caltech '13)	Summer 2011, Fall 2011, Spring 2012

## Courses Taught

**PHYS 7, Introductory Mechanics** - Fall 2020, Fall 2019, Fall 2018

**PHYS 7, Introductory Mechanics Lab** - Fall 2020, Fall 2018

**PHYS 113, Quantum Theory** - Spring 2020

**PHYS 13, Thermodynamics and Statistical Mechanics, 0.5 cr** - Spring 2020, Spring 2019

**PHYS 81/82/83, Advanced Laboratory** - Spring 2020, Fall 2019, Spring 2019, Fall 2018, instructor of record Fall 2019

**PHYS 62, Physics Journal Club, 0.5 cr** - Fall 2019

**PHYS 15, Optics, 0.5 cr** - Spring 2019

**Pomona College PHYS 174, Contemporary Experimental Physics** - Spring 2016

**Pomona College PHYS 41, General Physics Lab** - Spring 2015

**Pomona College PHYS 174, Spacetime, Quanta, and Entropy Lab** - Fall 2014

**Caltech MS 115B, Fundamentals of Materials Science** - Winter 2012 (teaching assistant)