

Brian Busemeyer

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EDUCATION

PhD in physics (August 2013–Summer 2019),
University of Illinois, Urbana-Champaign,
GPA 3.96/4.00.

BS in physics and mathematics (September 2008–June 2013),
Minor in Computer Science,
University of California, Davis,
GPA 3.87/4.00.

COMPUTATIONAL SKILLS

Quantum Monte Carlo: QWalk developer (qwalk.github.io).
Density functional theory: CRYSTAL, PySCF.

languages:

python, bash, C++, Julia, R;

packages:

pandas, scipy, scikit-learn, statsmodels, numpy, ggplot, matplotlib.

PUBLICATIONS

B. Busemeyer, M. Dagrada, S. Sorella, M. Casula, and L. K. Wagner
“Competing collinear magnetic structures in superconducting FeSe by first-principles quantum Monte Carlo calculations,”
Phys. Rev. B **94**, 035108 (2016).

H. Zheng, H. J. Changlani, K. T. Williams, B. Busemeyer and L. K. Wagner
“From Real Materials to Model Hamiltonians With Density Matrix Downfolding,”
Front. Phys., **11** (2018).

A. Narayan, B. Busemeyer, L. K. Wagner,
“Computation of the unifying thread in high temperature superconductors from first principles quantum Monte Carlo,”
arXiv:1705.01008 (2017)

K. Krongchon, B. Busemeyer, L. K. Wagner,
“Accurate barrier heights using diffusion Monte Carlo,”
J. Chem. Phys. **146**, **12**, 124129 (2017)

L. Damewood, M. Shaughnessy, B. Busemeyer, C. Y. Fong, L. H. Yang, and C. Felser
“Stabilizing and increasing the magnetic moment of half-metals: The role of Li in half-Heusler LiMnZ (Z=N,P,Si),”
Phys. Rev. B **91**, 064409 (2015).

ABSTRACTS

“A candidate predictor for high-temperature superconductivity,”
Center for Emergent Superconductivity (CES) Workshop,
Urbana, IL, November 2017.

“Competing collinear magnetic structures in superconducting FeSe from first principles quantum Monte Carlo,”
Telluride Science Research Center: Stochastic Methods in Electronic Structure Theory,
Telluride, CO, July 2017.

“Progress towards an effective model for FeSe from first-principles quantum Monte Carlo,”
APS March Meeting, New Orleans, LA, March 2017.

“Highly accurate calculation of the magnetic properties of FeSe and FeTe using first

principles quantum Monte Carlo,”
Gordon Conference: Correlated Electron Systems,
Mount Holyoke, MA, June 2016.

“Highly accurate calculation of the magnetic properties of FeSe and FeTe using first principles quantum Monte Carlo,” *APS March Meeting*,
Baltimore, MD, March 2016.

“An ab-initio quantum Monte Carlo analysis of pressure and magnetism in the unconventional superconductor, FeSe,”
APS March Meeting,
San Antonio, TX, March 2015.

“An ab-initio, many-body approach to understanding magnetism in the unconventional superconductor, FeSe,”
APS March Meeting,
Denver, CO, March 2014.

“Investigation into electronic and magnetic properties of wurtzite NiO thin films,”
APS March Meeting,
Baltimore, MD, March 2013.

“A detailed model for low-temperature n-butanol combustion,”
Sandia National Labs Intern Symposium,
Livermore, CA, July 2012. “Exploring Half Metals in Li-related Half Heusler Alloys.”
Undergraduate Research, Scholarship, and Creative Activities Conference,
Davis, CA, April 2012.

“Exploring Half Metals in Li-related Half Heusler Alloys,” *Annual Meeting of the California-Nevada Division APS*,
Menlo Park, CA, November 2011.

AWARDS

National Science Foundation Graduate Research Fellowship,
National Science Foundation, August 2014–May 2018.

Award for Excellence in Teaching
University of Illinois, December 2016 and June 2017

Saxon-Patten Prize in Physics,
UC Davis physics department, May 2013.

Mathematics Departmental Citation,
UC Davis mathematics department, May 2013.

Steven Chu Award for Best Research by an Undergraduate,
2011 Annual Meeting of the California-Nevada Division of the APS,
SLAC National Accelerator Laboratory, Menlo Park, CA, November 2011.

RESEARCH EXPERIENCE

Graduate Research Assistant
University of Illinois, Urbana-Champaign Physics Department, Urbana, IL
August 2013–present

- Studied magnetic properties of superconductors and transition metal systems
- Applied density functional and quantum Monte Carlo calculations.
- Built databases of materials properties.
- Machine-learning downfolding of quantum models of magnetic systems and superconductors.
- High-throughput tool set for calculations, available with QWalk (qwalk.github.io)

Undergraduate Research Assistant

May 2010–June 2012, September 2012–August 2013

- Density functional analysis of half-metal candidates.
- Implement self-consistent U correction for transition metals.

Summer Undergraduate Research Intern

June 2012–September 2012

- Built database of computational and experimental measurements of n -butanol combustion.
- Analyzed using master equation to improve model of reaction.

Undergraduate Research Assistant January 2010–May 2010

- Scanning tunneling microscopy of germanium surfaces.

**TEACHING
EXPERIENCE****Instructor,**

Telluride School on Stochastic Approaches to Electronic Structure,
Telluride, CO, July 2017.

Wrote and gave a lecture on variational Monte Carlo, prepared and supervised a hands-on session implementing the method.

Teaching Assistant,

University of Illinois Physics Dept.

August 2016–May 2017,

Organized 3 discussion sections of 20 students, proctor and graded quizzes and exams, wrote quizzes.

Reader/Teaching Assistant,

University of California, Davis Physics Dept.,

September 2009–December 2009, October 2010–December 2010

Graded freshman-level physics homework and tests. Proctored exams, held weekly office hours.

Tutor,

March 2009–June 2009

Gave private tutoring lessons of basic algebra and statistics.