

Christopher Nicholas Varney

Curriculum Vitae

CONTACT INFORMATION

Department of Physics
University of West Florida
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EDUCATION

University of California at Davis, Davis, CA, 2004 – 2009

Ph.D. in Physics, September 2009

Dissertation Title: Phase Transitions in Strongly Interacting Quantum Systems

Area of Specialization: Condensed Matter Physics

Research Advisor: Richard T. Scalettar

Committee Members: Richard T. Scalettar, Warren E. Pickett, Ching-Yao Fong

M.S. in Physics, 2005

Northern Arizona University, Flagstaff, AZ, 2000 – 2004

B.S. in Physics, Mathematics minor, summa cum laude, with honors

ACADEMIC POSITIONS

08/2013 – present

University of West Florida

Assistant Professor

09/2011 – 08/2013

University of Massachusetts, Amherst

Postdoctoral Fellow (Advisor: Prof. E. Babaev)

09/2009 – 08/2011

Georgetown University / Joint Quantum Institute

Postdoctoral Fellow (Advisors: Profs. M. Rigol and V. Galitski)

07/2005 – 09/2009

University of California at Davis

Graduate Researcher (Advisor: Prof. R. T. Scalettar)

08/2003 – 05/2004

Northern Arizona University

Undergraduate Researcher (Advisor: Prof. G. L. W. Hart)

06/2003 – 08/2003

Brookhaven National Laboratory

Summer Scholar (Advisor: Prof. M. White)

SHORT TERM VISITS

- October 2011: Visiting Scientist, KTH Royal Institute of Technology, Stockholm
- April 2011: Visiting scientist, Indian Institute of Science, Bangalore
- October-November 2010: Visiting scientist, Kavli Institute of Theoretical Physics, University of California, Santa Barbara
- June 2008: Visiting scientist, Instituto de Física, Universidade Federal do Rio de Janeiro
- November 2005: Visiting scientist, Department of Physics, University of Cincinnati

GRANTS & AWARDS

- UWF Quality Enhancement Plan Award (\$5000), 2015
- Office of Undergraduate Research Project Award, 2013, 2014
- Office of Undergraduate Research Travel Award, 2014
- National Science Foundation Dissertation Enhancement Grant, 2008
- UC Davis Graduate Assistance in Areas of National Need Fellowship, 2007-08 & 2008-09.
- UC Davis Physics Department Fellowship, Spring 2006
- Northern Arizona University Hooper Grant, Spring 2003

SCIENTIFIC IMPACT

13 journal articles, 1 conference publication, 1 technical report, and 1 manuscript in preparation. 3 Physical Review Letters, 1 New Journal of Physics, 6 Physical Review B, 1 Physical Review A, and 1 Journal of Physics: Condensed Matter. One publication highlighted by Physics Viewpoint [[Physics 4, 62 \(2011\)](#)]. One publication chosen as IOPselect (Journal of Physics: Condensed Matter) and two Editors' suggestion (Physical Review Letters and Physical Review B). Two publications selected by the APS Virtual Journal of Atomic Quantum Fluids. 303 total citations, h -index 9.

JOURNAL PUBLICATIONS

13. Qingyou Meng, **Christopher N. Varney**, Hans Fangohr, and Egor Babaev, [Honeycomb, square, and kagome vortex lattices in superconducting systems with multi-scale inter-vortex interactions](#). Phys. Rev. B **90**, 020509(R) (2014).
12. **Christopher N. Varney**, Karl A. H. Sellin, Qing-Ze Wang, Hans Fangohr, and Egor Babaev [Hierarchical structure formation in layered superconducting systems with multi-scale inter-vortex interactions](#) J. Phys.: Condens. Matter **25**, 415702 (2013); arXiv:1212.1130. IOPselect.
11. S. A. Kulagin, N. Prokof'ev, O. A. Starykh, B. Svistunov, and **C. N. Varney** [Bold Diagrammatic Monte Carlo Method Applied to Fermionized Frustrated Spins](#) Phys. Rev. Lett. **110**, 070601 (2013); arXiv:1212.0055.
10. S. A. Kulagin, N. Prokof'ev, O. A. Starykh, B. Svistunov, and **C. N. Varney** [Bold Diagrammatic Monte Carlo technique for frustrated spin systems](#) Phys. Rev. B. **87**, 024407 (2013); arXiv:1211.3631. Editors' Suggestion.
9. **C. N. Varney**, K. Sun, V. Galitski, and M. Rigol, [Quantum Phases of Hard-Core Bosons in a Frustrated Honeycomb Lattice](#) New Journal of Physics **14**, 115028 (2012); arXiv:1211.6941.
8. **Christopher N. Varney**, Kai Sun, Marcos Rigol, and Victor Galitski, [Topological Transitions for Interacting Finite Systems](#). Phys. Rev. B **84** 241105(R) (2011); arXiv:1108.2507.
7. **Christopher N. Varney**, Kai Sun, Victor Galitski, and Marcos Rigol, [Kaleidoscope of Exotic Quantum Phases in a Frustrated XY Model](#). Phys. Rev. Lett. **107** 077201 (2011); arXiv:1103.4123. Viewpoint: [Physics 4, 62 \(2011\)](#); Editor's Suggestion.
6. Simone Chiesa, **Christopher N. Varney**, Marcos Rigol, and Richard T. Scalettar, [Magnetism and pairing of two-dimensional trapped fermions](#). Phys. Rev. Lett. **106**, 035301 (2011); arXiv:1004.0970.
5. **Christopher N. Varney**, Kai Sun, Marcos Rigol, and Victor Galitski, [Interaction effects and quantum phase transitions in topological insulators](#). Phys. Rev. B **82**, 115125 (2010); arXiv:1007.3502. (Selected by APS Virtual Journal of Atomic Quantum Fluids.)
4. **Christopher N. Varney**, Simone Chiesa, Che-Rung Lee, Zhaojun Bai, Mark Jarrell, and Richard T. Scalettar, [Quantum Monte Carlo study of the two-dimensional fermion Hubbard Model](#) Phys. Rev. B **80**, 075116 (2009); arXiv:0903.2519. (Selected by APS Virtual Journal of Atomic Quantum Fluids.)
3. **Christopher N. Varney**, Valery G. Rousseau, and Richard T. Scalettar, [Quantum Monte Carlo study of the visibility of one-dimensional Bose-Fermi mixtures](#) Phys. Rev. A **77**, 041608(R) (2008); arXiv:0711.0968.

2. Helen A. Craig, **Christopher N. Varney**, Richard T. Scalettar and Warren E. Pickett, *Static versus dynamic fluctuations in the one-dimensional extended Hubbard model* *Phys. Rev. B* **76**, 125103 (2007); arXiv:0705.2043.
1. **Christopher N. Varney**, Gus L.W. Hart and Chris Wolverton, *A Coherency Strain Model for Hexagonal-Close-Packed Alloys* *TMS Lett.* **1**[2], 35 (2004).

CONFERENCE PUBLICATIONS

1. C. Prayaga, A. Wade, **C. Varney**, L. Prayaga, A. Whiteside, *A Robotic Interactive Learning Environment to Teach Physics*, EdMedia 2014: World Conference on Educational Media and Technology, Tampere, Finland, June 23 (2014).

TECHNICAL REPORTS

1. C.-R. Lee, S. Chiesa, **Christopher N. Varney**, E. Khatami, Z. Bai, E. D’Azevedo, M. Jarrell, Th. Maier, S. Savrasov, R. T. Scalettar, and K. Tomko, *QUEST: QUantum Electron Simulation Toolbox*. SciDAC2010, United States, July 2010.

PREPRINTS / MANUSCRIPTS IN PREPARATION

1. Qingyou Meng, **Christopher N. Varney**, Hans Fangohr, and Egor Babaev, *Phase diagrams of vortex matter with multi-scale inter-vortex interactions in layered superconductors*. Submitted for publication. arXiv:1605.00524

PRESS RELEASES ON MY RESEARCH

1. Ethan Brown. “Sign problems, Terry Tau, and open science.” *This Condensed Life*. Wordpress. 5 May 2015.
<https://thiscondensedlife.wordpress.com/2015/05/15/sign-problems-terry-tau-and-open-science/>
2. Joint Quantum Institute, University of Maryland. “Searching for spin liquids: Much-sought exotic state of matter can exist.” ScienceDaily. ScienceDaily, 14 August 2011.
www.sciencedaily.com/releases/2011/08/110812161813.htm
3. Alasdair Wilkins, “A Strange new Quantum State of Matter: Spin Liquids.” io9. Gawker Media, 11 August 2011.
<http://io9.gizmodo.com/5831111/a-strange-new-quantum-state-of-matter-spin-liquids>
4. Tameem Albash and Stephan Haas, “Viewpoint: Quantum liquids move to a higher dimension.” *Physics* **4**, 62, 8 August 2011.
<http://physics.aps.org/articles/v4/62>

INVITED TALKS

10. 26 Sep. 2014, National High Magnetic Field Laboratory, Tallahassee, FL
Structure Formation in Superconducting Systems with Multi-scale Inter-vortex Interactions
9. 28 Mar. 2013, University of West Florida, Pensacola, FL
7 Mar. 2013, Youngstown State University, Youngstown, OH
4 Feb. 2013, Illinois State University, Normal, IL
Frontiers in Quantum Mechanics
8. 21 Feb. 2013, University of Illinois, Urbana-Champaign, IL
23 Jan. 2013, Lawrence Livermore National Lab, Livermore, CA
Topological Phase Transitions
7. 30 Nov. 2012, Southern Connecticut State University, New Haven, CT
Frontiers in Quantum Mechanics: Topological Insulators and Quantum Spin Liquids
6. 17 Oct. 2011, KTH Royal Institute of Technology, Stockholm, Sweden
Kaleidoscope of Exotic Quantum Phases in a Frustrated XY Model

5. 18 Oct. 2011, KTH Royal Institute of Technology, Stockholm, Sweden
 14 Oct. 2011, Universität Würzburg, Würzburg, Germany
 12 Oct. 2011, RWTH Aachen University, Aachen, Germany
Topological Phase Transitions for Interacting Finite Systems
4. 11 Mar. 2011, George Mason University, Fairfax, VA
Quantum Phase Transitions in Topological Insulators and Quantum Spin Liquids
3. 9 Nov. 2010, University of Southern California, Los Angeles, CA
 28 Oct. 2010, University of California, Santa Cruz, CA
Interaction Effects and Quantum Phase Transitions in Topological Insulators
2. 27 May 2010, University of California, Davis, CA
Interaction Effects in Topological Insulators
1. 4 June 2008, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil
Bose-Fermi Mixtures in Optical Lattices and a Brief Overview of Graphene Nanoribbons

CONTRIBUTED TALKS

10. 2013 APS March Meeting, Baltimore, MD
Hierarchical mesophases of vortex matter in layered and multi-component superconductors
9. 2012 APS March Meeting, Boston, MA
Bose metal phase in a simple honeycomb lattice model.
8. 2011 APS March Meeting, Dallas, TX
Exotic quantum phases in a frustrated quantum spin model on a honeycomb lattice.
7. 2010 APS March Meeting, Portland, OR
Identifying topological phases in real space.
6. 2009 APS March Meeting, Pittsburgh, PA
High Precision Quantum Monte Carlo Study of the 2D Fermion Hubbard Model.
5. 2008 APS March Meeting, New Orleans, LA
Quantum Monte Carlo study of the visibility of one-dimensional Bose-Fermi mixtures
4. 2008 APS March Meeting, New Orleans, LA
The FFLO Phase in Imbalanced Fermion Systems in 1D
3. 2007 APS March Meeting, Denver, CO
Analysis of the Dynamical Cluster Approximation for the Triangular Lattice Hubbard Model
2. 2006 APS March Meeting, Baltimore, MD
A Quantum Monte Carlo Study of the Triangular Hubbard Model
1. 2004 APS March Meeting, Montréal, Québec
Strain Modeling for the Mg-Ca and Mg-Y Binary Systems

STUDENT* ORAL PRESENTATIONS

4. Justin A. Williams*, David A. Smith*, C.C.-Joseph Wang, and **Christopher N. Varney**
Exact Diagonalization of a Quantum XXZ Model with Long-Range Interactions
 2016 APS March Meeting, Baltimore, MD, Mar. 14-18, 2016.
3. Qingyou Meng*, **Christopher Varney**, Hans Fangohr, and Egor Babaev
Phase diagrams of vortex matter with multiple length scale pair interaction in layered superconductors
 2014 APS March Meeting, Denver, CO, Mar. 3-7, 2014.
2. Thomas Goldstein*, **Christopher Varney**, Egor Babaev, Nikolay Prokofiev, and Boris Svistunov
Quantum Monte Carlo study of the drag coefficient for two-component BECs
 2013 APS March Meeting, Baltimore, MD, Mar. 18-22, 2013.
1. Qingze Wang*, **Christopher Varney**, Hans Fangohr, and Egor Babaev
Molecular Dynamics of Type-1.5 Superconductors
 2012 APS March Meeting, Boston, MA, Feb. 27-Mar. 2, 2012.

STUDENT* POSTER PRESENTATIONS

6. Hailey X. Egido-Betancourt*, Leonard W. ter Harr, and **Christopher N. Varney**
Monte Carlo and Exact Diagonalization of Copper (II) Trimer Spin Frustrated Systems
2016 APS March Meeting, Baltimore, MD, Mar. 14-18, 2016.
5. Dimitri Baptiste*, David Kelly*, Twymun Safford*, Chandra Prayaga, **Christopher N. Varney**, and Aaron Wade
Phenomenological Modeling for Langmuir Monolayers
2016 APS March Meeting, Baltimore, MD, Mar. 14-18, 2016.
4. Shanna Muehe*, Thomas Gunn*, C.C-Joseph Wang, and **Christopher N. Varney**
Exact Diagonalization of a Quantum XXZ Model with Long-Range Interactions
2015 Student Scholar Symposium, University of West Florida
3. Shanna Muehe*, Thomas Gunn*, C.C-Joseph Wang, and **Christopher N. Varney**
Exact Diagonalization of a Quantum Ising Model with Long-Range Interactions
2015 APS March Meeting, San Antonio, TX, Mar. 2-6, 2015.
2. Shanna Muehe*, Thomas Gunn*, C.C-Joseph Wang, and **Christopher N. Varney**
Exact Diagonalization of a Quantum Ising Model with Long-Range Interactions
2015 APS Conference for Undergraduate Women in Physics, University of Mississippi, Jan. 16-18, 2015.
1. Shanna Muehe*, Thomas Gunn*, Omer Haq*, Brean Maynard*, and **Christopher N. Varney**
Long Range Quantum Magnetism
2014 Student Scholar Symposium, University of West Florida

WORKSHOPS LED

- CUTLA Workshop, “Facilitating Discussions & Peer Learning with Clicker Questions”, Pensacola, FL, 6 Feb. 2015.

WORKSHOPS / CONFERENCES ATTENDED

- Physics Teacher Education Coalition Conference
Baltimore, MD, 11-13 March 2016
- Wiley EdTech Focus Group, “Exploring Technology Solutions for Chemistry & Physics”
Orlando, FL, 16-18 Apr. 2015.
- AAPT Workshop for New Physics and Astronomy Faculty
American Center for Physics, College Park, MD, 23-26 June 2014
- KITP short-programs “Beyond Standard Optical Lattices” and “Disentangling Quantum Many-Body Systems”
University of California, Santa Barbara (visiting from 11 Oct. to 12 Nov. 2010).
- KITP conference on “Frontiers of Ultracold Atoms and Molecules”, University of California, Santa Barbara, 11-15 Oct. 2010
- APS workshop on “Topological Insulators”, Portland, OR, 14 Mar. 2010.
- Workshop on “Exotic Insulating States of Matter”
Johns Hopkins University, 14-16 Jan. 2010.
- Workshop on “Numerical Approaches to Quantum Many-Body Systems”
UCLA - Institute for Pure & Applied Mathematics, 26-30 Jan. 2009.
- 2005 APS March Meeting, Los Angeles, CA

ALGORITHMS / PROGRAMMING LANGUAGES

- Quantum Monte Carlo: Determinant QMC, World-Line QMC, Worm QMC, Diagrammatic QMC
- Exact Diagonalization & Lanczos Algorithm
- Fortran, C, C++, Python, Mathematica, MATLAB, \LaTeX

PROFESSIONAL AFFILIATIONS

- American Physical Society
- American Association of Physics Teachers
- Council on Undergraduate Research
- Golden Key Honour Society
- Phi Kappa Phi

PROFESSIONAL ACTIVITIES

- 2014-present CSE Scholars Advisory Committee
- 2011-2012 APS March Meeting Session Chair
- 2011 APS March Meeting Sorters Committee
- Referee for Physical Review Letters, Physical Review B, Physical Review X, Journal of Physics: Condensed Matter, Journal of Physics B: Atomic, Molecular & Optical Physics, New Journal of Physics
- University of California, Davis Colloquium Committee - 2009