

MICHAEL R. PETERSON

Curriculum Vitae

Home Address

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Departmental Address

Condensed Matter Theory Center
Department of Physics
University of Maryland College Park
College Park, MD 20742-4111
Office phone: (301)405-6174

Research

Postdoctoral Research Associate

University of Maryland College Park
Condensed Matter Theory Center
Department of Physics

Perform original research in theoretical condensed matter physics under the supervision of Prof. Sankar Das Sarma.

09/2007-present
College Park, MD

Postdoctoral Scholar

University of California Santa Cruz
Department of Physics

Perform original research in theoretical condensed matter physics under the supervision of Prof. B. Sriram Shastry.

09/2005-07/2007
Santa Cruz, CA

Education

Pennsylvania State University

Ph.D. in Physics

Advisor: Prof. Jainendra K. Jain

August 2005
University Park, PA

University of Utah

B.Sc. in Physics

May 2000
Salt Lake City, UT

University of Utah

B.Sc. in Mathematics

May 2000
Salt Lake City, UT

Publications

16. Michael R. Peterson, Kwon Park, and Sankar Das Sarma, *Spontaneous Particle-Hole Symmetry Breaking in the $\nu = 5/2$ Fractional Quantum Hall Effect*, arXiv:0807.0638v1 [cond-mat.mes-hall] (2008), submitted to Physical Review.

15. Michael R. Peterson, Chuanwei Zhang, Sumanta Tewari, and Sankar Das Sarma, *Realizing the Strongly Correlated d -Mott State in a Fermionic Cold Atom Optical Lattice*, arXiv:0805.4198v1 [cond-mat.str-el] (2008), submitted to Physical Review.

14. Michael R. Peterson, Thierry Jolicoeur, and Sankar Das Sarma, *Finite Layer Thickness Stabilizes the Pfaffian State for the $5/2$ Fractional Quantum Hall Effect: Wavefunction Overlap and Topological Degeneracy*, Physical Review Letters 101, 016807 (2008).

13. Michael R. Peterson and Sankar Das Sarma, *Orbital Landau level dependence of the fractional quantum Hall effect in quasi-two dimensional electron layers: finite-thickness effects*, arXiv:0801.4819v1 [cond-mat.mes-hall] (2008), submitted to Physical Review.

12. Michael R. Peterson, Subroto Mukerjee, B. Sriram Shastry, and Jan O. Haerter, *Dynamical thermal response functions for strongly correlated one-dimensional systems: Hubbard and spinless fermion t - V model*, Physical Review B 76, 125110 (2007).
11. Michael R. Peterson, B. Sriram Shastry, and Jan O. Haerter, *Thermoelectric effects in a strongly correlated model for Na_xCoO_2* , Physical Review B 76, 165118 (2007).
10. Jan O. Haerter, Michael R. Peterson, and B. Sriram Shastry, *Finite temperature properties of the triangular lattice t - J model, applications to Na_xCoO_2* , Physical Review B 74, 245118 (2006).
9. Jan O. Haerter, Michael R. Peterson, and B. Sriram Shastry, *Strong Correlations Produce the Curie-Weiss Phase of Na_xCoO_2* , Physical Review Letters 97, 226402 (2006).
8. Csaba Toke, Michael R. Peterson, Gun Sang Jeon, and Jainendra K. Jain, *Fractional quantum Hall effect in the second Landau level: The importance of inter-composite-fermion interaction*, Physical Review B 72, 125315 (2005).
7. Gun Sang Jeon, Michael R. Peterson, and J. K. Jain, *Microscopic tests of topological electron-vortex binding in the fractional Hall effect*, Physical Review B 72, 035304 (2005).
6. Jainendra K. Jain and Michael R. Peterson, *Reconstructing the Electron in a Fractionalized Quantum Fluid*, Physical Review Letters 94, 186808 (2005).
5. Jainendra K. Jain, Kwon Park, Michael R. Peterson and Vito W. Scarola,, *Composite Fermion Theory of Excitations in the Fractional Quantum Hall*, Solid State Communications 135, 602-609 (2005).
4. Michael R. Peterson and Jainendra K. Jain, *Flavor Altering Excitations of Composite Fermions*, Physical Review Letters 93, 046402 (2004).
3. Jainendra K. Jain, Chia-Chen Chang, Gun Sang Jeon, and Michael R. Peterson, *Composite fermions in the neighborhood of $\nu = 1/3$* , Solid State Communications 127, 805-811 (2003).
2. Michael R. Peterson and Jainendra K. Jain, *Possible persistence of fractional quantum Hall effect down to ultralow fillings*, Physical Review B 68, 195310 (2003).
1. Sudhansu S. Mandal, Michael R. Peterson, and Jainendra K. Jain, *Two-Dimensional Electron System in High Magnetic Fields: Wigner Crystal versus Composite-Fermion Liquid*, Physical Review Letters 90, 106403 (2003).

Research Interests

My research interests are in strongly correlated systems in condensed matter physics. Specifically I have worked on the fractional quantum Hall effect utilizing the composite-fermion theory. Other systems of particular interest are ones possessing the competing effects of strong electron correlations and geometrical frustration, e.g., interacting electrons on a triangular lattice experimentally realized in sodium cobalt oxide. The interface of fundamental theoretical physics and technology is of interest and wonderfully exemplified in the sodium cobalt oxide system attractive for both its physics and its engineering potential regarding

thermoelectrical applications. Another research interest is collective atomic phenomena in optical lattices with applications towards quantum computation as well as topological approaches to quantum computation.

In my research I employ a variety of numerical methods such as Monte Carlo, exact diagonalization, Lanczos diagonalization, finite temperature Lanczos, as well as parallelization using high performance computer clusters.

- Talks**
13. *Fractional Quantum Hall Effect in Higher Landau Levels* March 10, 2008
Contributed Talk, American Physical Society March Meeting New Orleans, LA

 12. *Thermoelectric effects in a strongly correlated model for Sodium Cobalt Oxide (Na_xCoO_2)* September 28, 2007
Condensed Matter Theory Center Symposium on “Quantum Phenomena”
University of Maryland College Park, MD

 11. *Thermal response functions for 1D strongly correlated electron systems* March 8, 2007
Contributed Talk, American Physical Society March Meeting Denver, CO

 10. *Fractional quantum Hall effect and composite fermions* February 12, 2007
Quantum Computing Seminar, UC Berkeley Berkeley, CA

 9. *Strong electron correlations and sodium cobalt oxide Na_xCoO_2* February 9, 2007
Condensed Matter Seminar, UC Santa Cruz Santa Cruz, CA

 8. *Exotic Excitations of Composite Fermions* March 15, 2006
Invited Talk, American Physical Society March Meeting Baltimore, MD

 7. *Thermoelectric properties of $\text{Na}_{0.68}\text{CoO}_2$ on a 2D triangular lattice* March 13, 2006
Contributed Talk, American Physical Society March Meeting Baltimore, MD

 6. *Two-Dimensional Electrons in a High Magnetic Field: Composite Fermions and the fractional quantum Hall effect* November 4, 2005
Condensed Matter Seminar, UC Santa Cruz Santa Cruz, CA

 5. *Re-emergence of the electron in a fractional quantum Hall fluid* March 24, 2005
Contributed Talk, American Physical Society March Meeting Los Angeles, CA

 4. *Excitations of Composite Fermions and the Stability of the Liquid State* March 26, 2004
Contributed Talk, American Physical Society March Meeting Montreal, CN

3. *Competition Between Wigner Crystal and Composite Fermion Liquid* March 3, 2003
Contributed Talk, American Physical Society March Meeting Austin, TX

2. *Seminar* March 18, 2004
Consortium for Education in Many-Body Applications
Seminar, The Pennsylvania State University University Park, PA

1. *Seminar* February 26, 2003
Consortium for Education in Many-Body Applications
Seminar, The Pennsylvania State University University Park, PA

Poster Session *Poster Session* December 11, 2003
Consortium for Education in Many-Body Applications
Poster Session, The Pennsylvania State University, University Park, PA

Summer School

The Electron Liquid Model in Condensed Matter Physics July 29 - August 8, 2003
International School of Physics <<Enrico Fermi>> Varenna, Italy

Awards and Honors

Duncan Fellowship 2001
Department of Physics The Pennsylvania State University

President's Award 1996-2000
Outstanding Scholastic Achievement The University of Utah

Outstanding Physics Junior Award 1998-1999
Department of Physics The University of Utah

Mathematical Contest in Modeling 1999
Honorable Mention The University of Utah

Journal Referee

Journal of Applied Physics

Memberships American Physical Society 2000 - present

Consortium for Education in Many-body Applications (CEMBA) 2002 - 2005
The Pennsylvania State University University Park, PA

Computer Skills

Programming: C, FORTRAN, HTML, Latex/Tex, Mathematica, Maple, MPI

Graphics: Grace, GNU-plot, XFIG

General: UNIX/LINUX, MS-Windows, MS-Office

Teaching Experience

Teaching Assistant Fall 2000
Professor: Dr. Roy F. Willis The Pennsylvania State University
Recitation instructor for undergraduate classical physics class.

Teaching Assistant Summer 2001
Professor: Dr. Rafael Garcia The Pennsylvania State University
Recitation/laboratory instructor for undergraduate thermodynamics/modern physics class.

Teaching Assistant Spring 2001 - Spring 2002
Professor: Dr. Xiaoxing Xi The Pennsylvania State University
Recitation/laboratory instructor for undergraduate thermodynamics/modern physics class.

References: available upon request