Edwin Miles Stoudenmire

Perimeter Institute for Theoretical Physics
31 Caroline Street North
Waterloo, Ontario
Canada N2L 2Y5

miles.stoudenmire@pitp.ca
miles.stoudenmire@gmail.com
Homepage: http://itensor.org/miles/

Research Experience

2013-Pres. Postdoctoral Fellow, Perimeter Institute for Theoretical Physics

2010-2013 Postdoctoral Researcher, UC Irvine
Supervisors: Steven R. White and Kieron Burke

- Performed state of the art simulations of model continuum electronic systems, frustrated magnets, and topologically ordered nanowires.
- Discovered a method for parallelizing the density matrix renormalization group (DMRG) algorithm in real space.
- Extensively developed an open-source C++ library for tensor product wavefunction algorithms and DMRG. Website: http://itensor.org/

2005-2010 Graduate Research Assistant, UC Santa Barbara
Supervisor: Leon Balents

- Applied a variety of analytical methods (bosonization, mean-field theory, spin wave calculations, high temperature series) to study frustrated magnets.
- Developed code based on the ALPS simulation library to implement a novel semi-classical algorithm for finite temperature quantum magnets.
- Collaborated with Steven R. White on a new method for simulating finite temperature quantum systems (METTS algorithm).

Education

2010 PhD in Physics, UC Santa Barbara. Advisor: Leon Balents
2005 BS in Physics, Georgia Institute of Technology, highest honors
2005 BS in Mathematics, Georgia Institute of Technology, highest honors

Publications

2014 Lucas O. Wagner, Thomas E. Baker, **E.M. Stoudenmire**, Kieron Burke, and Steven R. White , "Kohn-Sham Calculations with the Exact Functional", arxiv:1405.0864

2014 A.B. Kallin, **E.M. Stoudenmire**, P. Fendley, R.R.P. Singh and R.G. Melko , "Corner Contribution to the Entanglement Entropy of an O(3) Quantum Critical Point in 2+1 Dimensions", *J. Stat. Mech.*

2013 Lucas O. Wagner, **E.M. Stoudenmire**, Kieron Burke, and Steven R. White , "Guaranteed Convergence of the Kohn-Sham Equations", *Phys. Rev. Lett.* **111**: 093003 [**Editor's suggestion**]

2013 **E.M. Stoudenmire** and Steven R. White, "Real-space parallel density matrix renormalization group", *Phys. Rev. B* **87**: 155137

2013 Salvatore R. Manmana, **E.M. Stoudenmire**, Kaden R.A. Hazzard, Ana Maria Rey and Alexey V. Gorshkov, "Topological phases in ultracold polar-molecule quantum magnets", *Phys. Rev. B* **87**: 081106(R)

2012 **E.M. Stoudenmire**, Lucas O. Wagner, Steven R. White and Kieron Burke, "One-dimensional continuum electronic structure with the density matrix renormalization group and its implications for density functional theory", *Phys. Rev. Lett.* **109**: 056402

2012 Lucas O. Wagner, **E.M. Stoudenmire**, Kieron Burke and Steven R. White, "Reference electronic structure calculations in one dimension", *Phys. Chem. Chem. Phys.* **14**: 8581

2012 **E.M. Stoudenmire** and Steven R. White, "Studying two dimensional systems with the density matrix renormalization group", *Annual Reviews of Condensed Matter Physics* **3**: 111

2011 **E.M. Stoudenmire,** Jason Alicea, Oleg A. Starykh and Matthew P.A. Fisher, "Interaction effects in topological superconducting wires supporting majorana fermions", *Phys. Rev. B* **84**: 014503 [**Editor's suggestion**, Synopsis Article]

2010 **E.M. Stoudenmire** and Steven R. White, "Minimally entangled typical thermal state algorithms" *New J. Phys.* **12**: 055026

2009 **E.M. Stoudenmire**, Simon Trebst and Leon Balents, "Quadrupolar correlations and spin freezing in S=1 triangular lattice antiferromagnets", *Phys. Rev. B* **79**: 214436

2008 **E.M. Stoudenmire** and Leon Balents, "Ordered phases of the anisotropic kagome lattice antiferromagnet in a field", *Phys. Rev. B* **77**: 174414

2005 **E.M. Stoudenmire** and C.A.R. Sá de Melo, "Magnetoresistive effects in ferromagnet-superconductor multilayers", *J. Appl. Phys.* **97**: 10J108

Invited Talks

May 2014 UC Irvine, *"Numerical Evidence for Fibonacci Anyons in Lattice Models of Quantum Hall / Superconductor Heterostructures"*. Irvine, CA.

Dec 2012 Northeastern University, *"Introduction to MPS with the ITensor Library"* (2 lectures and hands-on tutorials). Boston, MA.

Dec 2012 National Taiwan University, Winter School: DMRG 101. *"Studying Density Functional Theory and One-Dimensional Electronic Structure with DMRG"*. Taipei, Taiwan. Video and Slides

Sep 2012 LMU München, *"Parallelizing DMRG in Real Space"*. Munich, Germany.

Sep 2012 ITP Univ. of Cologne, *"New Tools for Simulating Realistic Systems with DMRG"*. Cologne, Germany.

Aug 2012 JILA and CU Dept. of Physics, *"Simulating Realistic Systems with DMRG"*. Boulder, CO.

May 2012 UC Merced Dept. of Chemistry, *"Exact Electronic Structure in 1d"*. Merced, CA.

Mar 2012 IMSC Chennai, K.S. Krishnan Meeting on Tensor Network States
"From DMRG to Tensor Network States" (2 Lectures, Delivered Online). Chennai, India.

Mar 2012 APS March Meeting, Symposium on DFT, *"Exact Density Functional Calculations with DMRG"*. Boston, MA.

Jun 2011 Microsoft Station Q Seminar, *"Interaction Effects in Topological Superconducting Wires"*. Santa Barbara, CA.

Oct 2010 L.A. Cond. Mat. Theory Meeting, *"DMRG Meets DFT"*. Pasadena, CA.

Teaching Experience

2012-13 Substitute Lecturer. UCI advanced undergraduate quantum mechanics and condensed matter physics (6 Lectures).

2008 Substitute Lecturer. UCSB graduate condensed matter physics (4 Lectures).

2005-2009 Teaching Assistant. UCSB graduate courses in quantum many-body methods, condensed matter physics and advanced statistical mechanics.

2004-2005 Kaplan SAT Instructor. Atlanta, GA. Taught large classes of high school students from a wide range of socioeconomic backgrounds.

2002-2005 Teaching Assistant, Georgia Tech undergraduate mathematics courses
Taught weekly recitation sections for three years.

Selected Activities

May 2013 Emergence & Entanglement II Conference, Perimeter Institute for Theoretical Physics

Sep 2012 Autumn School on Correlated Electrons: From Models to Materials.
Forschungzentrum Jülich, Germany.

Jul 2010 Boulder Summer School in Condensed Matter Physics, *Computational Methods*.
Boulder, CO.

Dec 2009 ICTS Winter School on Condensed Matter Physics. Mahabaleshwar, India.

Mar 2009 IACS Conference on Recent Trends in Strongly Correlated Systems. Kolkata, India.

Jan 2009 IPAM Workshop on Numerical Approaches to Quantum Many-Body Systems. UCLA.

Jul 2008 Boulder Summer School in Condensed Matter Physics, *Strongly Correlated Materials*.
Boulder, CO.

Aug 2007 Abdus Salam ICTP School and Workshop on Highly Frustrated Magnets. Trieste, Italy.

2007-2010 Seminar organizer, UCSB Condensed Matter Theory Group

References

Prof. Steven R. White (srwhite@uci.edu)
Department of Physics and Astronomy
2172 Frederick Reines Hall, Mail Code: 4575
University of California, Irvine, CA 92697 USA
T +1 (949) 824-2256
Website

Prof. Leon Balents (balents@kitp.ucsb.edu)
Kavli Institute for Theoretical Physics
University of California,
Santa Barbara, CA 93106 USA
T +1 (805) 893-6381
Website

Prof. Kieron Burke (kieron@uci.edu)
Departments of Chemistry and Physics
Natural Sciences II, 2145
University of California, Irvine, CA 92697 USA
T +1 (949) 824-0374
Website

Prof. Jason Alicea (aliceaj@caltech.edu)
Department of Physics, Caltech
MC 149-33
Pasadena CA 91125 USA
T +1 (626) 395-2934
Website

Prof. Roger Melko (rgmelko@uwaterloo.ca)
Department of Physics
University of Waterloo
200 University Ave. W.
Waterloo, ON N2L 3G1 Canada
T +1 (519) 888-4567
Website