

## Anders W. Sandvik, Curriculum Vitae, February 2017

Address: Department of Physics, Boston University, 590 Commonwealth Ave., Boston, MA 02215  
Phone: (617) 353-3843, Fax: (617) 353-9393, E-mail: [sandvik@bu.edu](mailto:sandvik@bu.edu)  
Web page: <http://physics.bu.edu/~sandvik>

### Personal

Born April 6, 1965, in Jakobstad, Finland, citizen of Finland, permanent resident of the USA.

### Education

1990 - 1993                      University of California, Santa Barbara  
Dec. 1993                      Doctor of Philosophy in Physics  
                                    Advisor: Douglas Scalapino  
                                    Thesis title: *Quantum Monte Carlo Studies of Some Low-Dimensional Quantum Many-Particle Systems.*

1985 - 1990                      Åbo Akademi University, Finland  
May 1989                      Filosofie Kandidat (Master of Science) in Physics  
                                    Advisor: Juhani Kurkijärvi  
                                    Thesis title: *Kvant Monte Carlo Simulering* (Quantum Monte Carlo Simulation).

### Academic appointments

2008 -                              Professor of physics,  
                                    Department of Physics, Boston University.

2004 - 2008                      Associate professor of physics (tenured),  
                                    Department of Physics, Boston University.

Aug. 2000 - Dec. 2003        Senior research fellow of the Academy of Finland,  
                                    Department of Physics, Åbo Akademi University.

Aug. 1999 - Jul. 2000        Visiting research assistant professor,  
                                    Department of Physics, University of Illinois at Urbana-Champaign.

Oct. 1996 - July 1999        Post-doctoral research associate (advisor: David Campbell),  
                                    Department of Physics, University of Illinois at Urbana-Champaign.

Oct. 1994 - Sep. 1996        Post-doctoral research associate (advisor: Elbio Dagotto)  
                                    National High Magnetic Field Laboratory, Florida State University, Tallahassee.

Dec. 1993 - Sep. 1994        Post-doctoral research associate (advisor: Douglas Scalapino),  
                                    Department of Physics, University of California, Santa Barbara.

### Other academic affiliations

Aug. 2016 -                      Affiliated Member,  
                                    Beijing Computational Science Research Center, Beijing, China

Feb. 2015 - May. 2015        Visiting Research Fellow,  
                                    Department of Physics, National Taiwan University, Taipei, Taiwan

May 2012 - April 2014        Affiliated scientist,  
                                    National Center for Theoretical Sciences, Hsinchu, Taiwan

July 2011 - June 2014        Visiting professor (part-time residence),  
                                    School of Physics and Engineering, Sun Yat-Sen University, Guangzhou, China

Dec. 2007 - May. 2008        Visiting professor,  
                                    Institute for Solid State Physics, The University of Tokyo, Japan

Aug. 1998 - Aug. 1999 Visiting scholar,  
Center for Nonlinear Studies, Los Alamos National Laboratory.

### **Short-term research appointments and visits (2 weeks or longer)**

Oct 2014 - Dec 2014 Institute of Physics, Chinese Academy of Sciences, Beijing, China

Dec. 2013 - Jan. 2014 Gordon Godfrey Visiting Fellow,  
School of Physics, The University of New South Wales, Sydney, Australia.

Dec. 2011 - Jan. 2012 Department of Physics, National Taiwan University, Taipei, Taiwan

Dec. 2010 - Jan. 2011 Department of Physics, National Taiwan University, Taipei, Taiwan

June 2010 Department of Physics, Sun Yat-sen University, Guangzhou, China

May 2009 Department of Physics, National Taiwan University, Taipei, Taiwan

Dec. 2008 - Jan. 2009 Gordon Godfrey Visiting Fellow,  
School of Physics, The University of New South Wales, Sydney, Australia.

Aug. - Nov. 2007 Department of Physics, National Taiwan University, Taipei, Taiwan

June 2007 School of Physical Sciences, The University of Queensland, Australia

Nov. 2006 Center for Advanced Study, The Norwegian Academy of Science and Letters,  
Research program on Spin and Charge Flow in Nanostructures.

Apr. 2004 - May 2004 Institute of Theoretical Physics, University of California, Santa Barbara,  
Research program on Exotic Order and Criticality in Quantum Matter.

Jan. 2003 - July 2003 Department of Physics, University of California, Santa Barbara.

Jan. 2002 - June 2002 Department of Physics, University of California, Santa Barbara.

Nov. 2000 - Dec. 2000 Gordon Godfrey Visiting Fellow,  
School of Physics, The University of New South Wales, Sydney, Australia.

Oct. 1999 - Dec. 1999 Institute of Theoretical Physics, University of California, Santa Barbara,  
Research program on Magnetic Phenomena in Novel Materials and geometries.

Nov. 1998 - Dec. 1998 Gordon Godfrey Visiting Fellow,  
School of Physics, The University of New South Wales, Sydney, Australia.

June 1998 Institut Romand de Recherche Numérique en Physique des Materiaux (IRRMA),  
Lausanne, Switzerland.

### **Fellowships and Awards**

- 2014, Simons Fellow in Theoretical Physics.
- 2007, Fellow of the American Physical Society.
- 2001, Per Brahe Science Prize (annual science prize of the Åbo Akademi Foundation).
- 1991, The Harry Elving Foundation, fellowship for graduate studies.
- 1990, Fulbright fellowship for graduate studies in the USA.
- 1988, The Finnish Particle Physics Committee's fellowship for summer studies at the European Center for High Energy Physics (CERN), Geneva, Switzerland.

### **Research Grants**

- The Simons Foundation, 2014-2015, \$150,000 for *Sabbatical Research in Quantum Many-Body Theory*.

- The National Science Foundation, 2014-2017, \$396,000 for *Simulation studies of ground state phases and criticality in correlated quantum matter* (sole PI).
- The National Science Foundation, 2012-2015, \$345,000 for *Quantum Monte Carlo methods for non-equilibrium dynamics of interacting quantum many-body systems* (PI, co-PI: Anatoli Polkovnikov).
- The National Science Foundation, 2011-2014, \$375,000 for *Simulation studies of ground state phases and criticality in correlated quantum matter* (sole PI).
- The National Science Foundation, 2008-2011, \$360,000 for *Simulation studies of ground state phases and criticality in correlated quantum matter* (sole PI).
- The National Science Foundation, 2005-2008, \$246,000 for *Simulation studies of ground state phases and criticality in correlated quantum matter* (sole PI).
- The Academy of Finland, 2001-2004, 600,000 FIM (100,900 EUR) for *Numerical studies of correlated quantum systems* (sole PI).
- The Väisälä foundation (Finland), 2001, 284,000 FIM (57,430 EUR) for *Linux cluster for computational physics applications* (sole PI).

## Teaching

Courses at Boston University:

- PY355, Methods of Theoretical Physics; Spring 2016, 2017.
- PY502, Computational Physics; Fall 2004, 2005, 2006, 2008, 2009, 2010, 2011, 2012, 2013, 2015, 2016.
- PY410, Statistical Thermodynamics; Spring 2013, 2014.
- PY896, Special Topics in Theoretical Physics (Quantum Magnetism); Spring 2011.
- PY212, General Physics II (Electromagnetism); Spring 2005, 2006, 2007.

Lectures at summer schools and other educational events:

- International Summer School on Computational Approaches to Quantum Many-Body Systems, UCAS Beijing, August 1-19, 2016. Two lectures: 1) *Stochastic series expansion for simulations of quantum spins*, 2) *Spectral functions and analytic continuation of quantum Monte Carlo data*.
- ICTP School in Computational Condensed Matter Physics: From Atomistic Simulations to Universal Model Hamiltonians, September 2015. Four lectures: 1) *Stochastic series expansion method for simulations of quantum spins*, 2) *Ground-state projection of quantum spins in the valence bond basis*, 3) *Systematic finite-size scaling methods for analyzing critical points and ordered phases*, 4) *Out-of-equilibrium quantum Monte Carlo simulation and quantum annealing*.
- School on Quantum Monte Carlo Methods at Work for Novel Phases of Matter, SISSA/ICTP, Trieste, Italy, January 23 - February 3, 2012: Three lectures: 1) *Stochastic Series Expansion Algorithms for Quantum Spin Systems*, 2) *Ground State Projector Monte Carlo and the Valence Bond Basis for  $S=1/2$  Systems*, 3) *Quantum Monte Carlo simulations of deconfined quantum criticality*. Two 3-hour hands-on computer tutorials on quantum Monte Carlo methods and applications.
- Theory Winter School, National High Magnetic Field Laboratory, Tallahassee, Florida, January 9-13, 2012. Two lectures: 1) *Stochastic Series Expansion Algorithms for Quantum Spin Systems* 2) *Quantum Monte Carlo simulations of deconfined quantum criticality*. One hands-on computer lab/tutorial on quantum Monte Carlo.
- PSI Summer School 2011, “Probing Phase Transitions using Photons, Muons, and Neutrons”, Zugerberg, Switzerland, August 13-19, 2011: Quantum Phase Transitions in Spin Systems.
- Workshop on Synergies between Field Theory and Exact Computational Methods in Strongly Correlated Quantum Matter, ICTP, Trieste, Italy, July 24-29, 2011: Two tutorial lectures; 1) *Introduction to quantum Monte Carlo studies of spin systems*, 2) *Quantum Monte Carlo studies of quantum-critical phenomena*.

- Summer School on Computational Statistical Physics, National Cheng-Chi University, Taipei, Taiwan, August 4-11, 2010: Six lectures and three afternoon tutorials on *Quantum spin systems—models and computational methods*.
- Perimeter Scholars International, the M.Sc. program at the Perimeter Institute, Waterloo, Ontario, Canada. 15-hour course on *Quantum Spin Simulations*, April 5-23, 2010.
- International Center for Theoretical Sciences (Tata Institute For Fundamental Science, India), Condensed Matter Theory Programme, December 5-12, 2009, Mahabaleshwar, India. Five lectures on *Computational methods for strongly-correlated quantum systems*.
- XIV Training Course on Strongly Correlated Systems Vietri Sul Mare, Salerno, Italy, October 5-16, 2009. Five two-hour lectures and two computer training sessions on *Computational studies of quantum spin systems*.
- Algebraic and computational methods for strongly-correlated systems, University of Gothenburg, Sweden, August 18-23, 2008: Four lectures on “Quantum Monte Carlo methods and applications”.
- The 11th Jyväskylä Summer School, Jyväskylä, Finland, August 2001. 10-lecture course on *Quantum Monte Carlo methods for lattice quantum many-body systems*.
- The 1996 El Escorial Summer School “Strongly Correlated Superconducting and Magnetic Systems”, Madrid, Spain, July 14-19, 1996: Three lectures on *Quantum Monte Carlo methods and their applications*.

### Graduate students advised

- Current graduate students at Boston University: Adam Iaizzi, Pranay Patil, Phillip Weinberg, Na Xu.
- Cheng-Wei Liu, Boston University, Ph.D. 2014. Currently at HP Vertica, Cambridge, MA.
- Ying Tang, Boston University, Ph.D. 2013. Currently at Bloomberg, New York.
- Songbo Jin, Boston University, Ph.D. 2013. Currently at Google, California.
- Chen Liu, Boston University, Ph.D. 2012. Currently at CGG Veritas, Houston, Texas.
- Jie Lou, Boston University, Ph.D. 2009. Currently associate professor at Fudan University, Shanghai, China.
- Ling Wang, Boston University, Ph.D. 2009. Currently assistant professor at Beijing Scientific Computation Research Center.
- Kaj Höglund, Åbo Akademi University, Finland, Fil. Lic. 2004, Fil. Dr. 2010. Currently at Veritas Pension Insurance Company, Ltd, Turku, Finland.

### Postdoctoral researchers advised

- Hui Shao, Boston University, Aug. 2015 - present.
- Hidemaro Suwa, Boston University, 2012-14. Supported by fellowship from the Japanese Society for the Promotion of Science. Assistant Professor, The University of Tokyo, Japan.
- Arnab Sen, Boston University, 2009-11. Assistant professor, Indian Institute of Advancement of Science, Kolkata, India.
- Kevin Beach, Boston University, 2004-2006. Assistant professor, University of Mississippi, Oxford, MS.

### Professional Service

- Director of Boston University’s Condensed Matter Theory Visitors Program.

- Member of the Editorial Board of *Journal of Statistical Mechanics, Theory and Experiment* (2004-).
- Member of International Advisory Board, CCP2017 - IUPAP International Conference on Computational Physics, to be held in Paris, France, July 2017.
- Member of International Advisory Board, CCP2016 - IUPAP International Conference on Computational Physics, Gauteng, South Africa, July 10-14, 2016.
- Member of International Advisory Board, IUPAP Conference on Computational Physics, CCP2015, Guwahati, Assam, India, December 2015, 2015.
- Organizer (with P. Sengupta and Z. Huang) of Symposium “Quantum many body systems” at *The 9th International Conference on Computational Physics*, Singapore, January 7-11, 2015.
- Organizer (with M. Araújo, D. Arovas, J. Carmelo, J. Fernández-Rossier, H.-Q. Lin, A. Muramatsu, N. Paunkovic, M. Vozmediano (CSIC, Madrid, Spain) or conference *Correlations, criticality, and coherence in quantum systems*, Évora, Portugal, 6-10 October 2014.
- Chair of the XXVI IUPAP Conference on Computational Physics, CCP2014, Boston, August 11-14, 2014 (360 participants from 38 countries).
- Organizer (with E. Ardonne and S. Powell) of the NORDITA program *Novel Directions in Frustrated and Critical Quantum Magnetism*, July 14 - August 8, 2014.
- Member at Large of the Executive Committee of the *Division of Computational Physics* of the American Physical Society (2011-2014).
- Member of the Program Committee of the 2012 March Meeting of the American Physical Society, organizing sessions for the Division of Computational Physics; convener of focus session *Computational Frontiers in Quantum Spin Systems* (2011-12).
- Organizer (with Y.-C. Lin, Y.-J. Kao, and P.-C. Chen), of the workshop *Statistical Mechanics of Quantum Matter*, Taipei, Taiwan, July 28-31, 2013.
- Organizer (with R. Kaul, M. Müller, M. Vojta) of the workshop *Synergies between Field Theory and Exact Computational Methods in Strongly Correlated Quantum Matter*, International Center for Theoretical Physics (ICTP), Trieste, Italy, July 24-29, 2011.

### Publications in Refereed Journals

- [130] Y. Q. Qin, B. Normand, A. W. Sandvik, and Z. Y. Meng, The amplitude mode in three-dimensional dimerized antiferromagnets, *Phys. Rev. Lett.* (in press).
- [129] A. W. Sandvik, Constrained sampling method for analytic continuation, *Phys. Rev. E* **94**, 063308 (2016).
- [128] Y.-R. Shu, D.-X. Yao, C.-W. Ke, Y.-C. Lin, and A. W. Sandvik, Properties of the random-singlet phase: From the disordered Heisenberg chain to an amorphous valence-bond solid, *Phys. Rev. B* **94**, 174442 (2016).
- [127] H. Suwa, Arnab Sen, and A. W. Sandvik, Level spectroscopy in a two-dimensional quantum magnet: linearly dispersing spinons at the deconfined quantum-critical point, *Phys. Rev. B* **94**, 144416 (2016).
- [126] H. Shao, W. Guo, and A. W. Sandvik, Quantum criticality with two length scales, *Science* **352**, 213 (2016).
- [125] Y. Q. Qin, B. Normand, A. W. Sandvik, and Z. Y. Meng, Multiplicative logarithmic corrections to quantum criticality in three-dimensional dimerized antiferromagnets, *Phys. Rev. B* **92**, 214401 (2015).
- [124] Y. Tang and A. W. Sandvik, Quantum Monte Carlo studies of spinons in one-dimensional spin systems, *Phys. Rev. B* **92**, 184425 (2015).
- [123] A. Sen, H. Suwa, and A. W. Sandvik, Velocity of excitations in ordered, disordered, and critical antiferromagnets, *Phys. Rev. B* **92**, 195145 (2015).

- [122] C.-W. Liu, A. Polkovnikov, A. W. Sandvik, and A. P. Young, Universal dynamic scaling in three-dimensional Ising spin glasses, *Phys. Rev. E* **92**, 022128 (2015).
- [121] C.-W. Liu, A. Polkovnikov, and A. W. Sandvik, Quantum versus classical annealing: insights from scaling theory and results for spin glasses on 3-regular graphs, *Phys. Rev. Lett.* **114**, 147203 (2015).
- [120] H. Shao, W. Guo, and A. W. Sandvik, Emergent topological excitations in a two-dimensional quantum spin system, *Phys. Rev. B* **91**, 094426 (2015).
- [119] Y. Wang, W. Guo, and Anders W. Sandvik, Anomalous Quantum Glass of Bosons in a Random Potential in Two Dimensions *Phys. Rev. Lett.* **114**, 105303 (2015).
- [118] N. Ma, A. W. Sandvik, and D.-X. Yao, Criticality and Mott-glass phase in a disordered 2D quantum spin systems, *Phys. Rev. B* **90**, 104425 (2014).
- [117] C.-W. Liu, A. Polkovnikov, and A. W. Sandvik, Dynamic scaling at classical phase transitions approached through non-equilibrium quenching, *Phys. Rev. B* **89**, 054307 (2014).
- [116] Y.-D. Hsieh, Y.-J. Kao, and A. W. Sandvik, Finite-size scaling method for the Berezinskii-Kosterlitz-Thouless transition, *J. Stat. Mech.* (2013) P09001.
- [115] Y. Tang and A. W. Sandvik, Confinement and Deconfinement of Spinons in Two Dimensions, *Phys. Rev. Lett.* **110**, 217213 (2013).
- [114] C.-W. Liu, A. Polkovnikov, and A. W. Sandvik, Quasi-adiabatic quantum Monte Carlo algorithm for quantum evolution in imaginary time, *Phys. Rev. B* **87**, 174302 (2013).
- [113] C. De Grandi, A. Polkovnikov, and A. W. Sandvik, Microscopic theory of non-adiabatic response in real and imaginary time, *J. Phys.: Condens. Matter* **25**, 404216 (2013).
- [112] S. Jin and A. W. Sandvik, Thermal valence-bond-solid transition of quantum spins in two dimensions, *Phys. Rev. B* **87**, 180404(R) (2013).
- [111] S. Jin, A. Sen, W. Guo, and A. W. Sandvik, Phase transitions in the frustrated Ising model on the square lattice, *Phys. Rev. B* **87**, 144406 (2013).
- [110] R. K. K. Kaul, R. G. Melko, and A. W. Sandvik, Bridging lattice-scale physics and continuum field theory with quantum Monte Carlo simulations, *Annu. Rev. Con. Mat. Phys.* **4**, 179 (2013).
- [109] E. Farhi, D. Gosset, I. Hen, A. W. Sandvik, P. Shor, A. P. Young, and F. Zamponi, Performance of the quantum adiabatic algorithm on random instances of two optimization problems on regular hypergraphs, *Phys. Rev. A* **86**, 052334 (2012).
- [108] Y.-C. Lin, Y. Tang, J. Lou, and A. W. Sandvik, Correlated valence-bond states, *Phys. Rev. B* **86**, 144405 (2012).
- [107] S. Sanyal, A. Banerjee, K. Damle, and A. W. Sandvik, Antiferromagnetic order in systems with doublet  $S_{\text{tot}} = 1/2$  ground states, *Phys. Rev. B* **86**, 064418 (2012).
- [106] A. W. Sandvik, Finite-size scaling and boundary effects in two-dimensional valence-bond-solids, *Phys. Rev. B* **85**, 134407 (2012).
- [105] R. K. Kaul and A. W. Sandvik, Lattice Model for the  $SU(N)$  Néel to Valence-Bond Solid Quantum Phase Transition at Large  $N$ , *Phys. Rev. Lett.* **108**, 137201 (2012).
- [104] C. Liu, D.-X. Yao, and A. W. Sandvik, Two-orbital quantum spin model of magnetism in the iron pnictides, *Phys. Rev. B* **85**, 094410 (2012).
- [103] S. Jin and A. W. Sandvik, Universal Néel temperature in three-dimensional quantum antiferromagnets, *Phys. Rev. B* **85**, 020409 (2012).
- [102] S. Jin, A. Sen, and A. W. Sandvik, Ashkin-Teller Criticality and Pseudo-First-Order Behavior in a Frustrated Ising Model on the Square Lattice, *Phys. Rev. Lett.* **108**, 045702 (2012).
- [101] C. De Grandi, A. Polkovnikov, and A. W. Sandvik, Universal nonequilibrium quantum dynamics in imaginary time, *Phys. Rev. B* **84**, 224303 (2011).

- [100] Y. Tang, A. W. Sandvik, and C. L. Henley, Properties of resonating-valence-bond spin liquids and critical dimer models, *Phys. Rev. B* **84**, 174427 (2011).
- [99] Y. Tang and A. W. Sandvik, Method to Characterize Spinons as Emergent Elementary Particles, *Phys. Rev. Lett.* **107**, 157201 (2011).
- [98] A. W. Sandvik, V. N. Kotov, and O. P. Sushkov, Thermodynamics of a Gas of Deconfined Bosonic Spinons in Two Dimensions. *Phys. Rev. Lett.* **106**, 207203 (2011).
- [97] L. Wang, Y.-J. Kao, and A. W. Sandvik, Plaquette renormalization scheme for tensor network states, *Phys. Rev. E* **83**, 056703 (2011).
- [96] Y.-C. Lin and A. W. Sandvik, Definitions of entanglement entropy of spin systems in the valence-bond basis, *Phys. Rev. B* **82**, 224414 (2010).
- [95] A. Sen and A. W. Sandvik, Example of a first-order Néel to valence-bond-solid transition in two dimensions, *Phys. Rev. B* **82**, 174428 (2010).
- [94] D.-X. Yao, J. Gustafsson, E. W. Carlson, and A. W. Sandvik, Quantum phase transitions in disordered dimerized quantum spin models and the Harris criterion, *Phys. Rev. B* **82**, 172409 (2010).
- [93] C. Liu, L. Wang, A. W. Sandvik, Y.-C. Su, and Y.-J. Kao, Symmetry breaking and criticality in tensor-product states, *Phys. Rev. B* **82**, 060410 (2010).
- [92] A. W. Sandvik and H. G. Evertz, Loop updates for variational and projector quantum Monte Carlo simulations in the valence-bond basis, *Phys. Rev. B* **82**, 024407 (2010).
- [91] W. Zhang, W. Guo, L. Wang, K. H. Höglund, and A. W. Sandvik, Effects of edge disorder in nanoscale antiferromagnetic clusters, *Phys. Rev. B* **82**, 012401 (2010).
- [90] A. W. Sandvik, Continuous quantum phase transition between an antiferromagnet and a valence-bond-solid in two dimensions: Evidence for logarithmic corrections to scaling, *Phys. Rev. Lett.* **104**, 177201 (2010).
- [89] A. W. Sandvik, Ground states of a frustrated quantum spin chain with long-range interactions, *Phys. Rev. Lett.* **104**, 137204 (2010).
- [88] L. Wang and A. W. Sandvik, Nature of the low-energy excitations of two-dimensional diluted Heisenberg quantum antiferromagnets, *Phys. Rev. B* **81**, 054417 (2010).
- [87] J. Lou and A. W. Sandvik,  $Z_4$  to  $U(1)$  crossover of the order-parameter symmetry in a two-dimensional valence-bond solid, *Phys. Rev. B* **80**, 212406 (2009).
- [86] J. Lou, A. W. Sandvik, and N. Kawashima, Antiferromagnetic to valence-bond-solid transitions in two-dimensional  $SU(N)$  Heisenberg models with multispin interactions, *Phys. Rev. B* **80**, 180414(R) (2009).
- [85] C.-W. Liu, S. Liu, Y.-J. Kao, A. L. Chernyshev, and A. W. Sandvik, Impurity-Induced Frustration in Correlated Oxides, *Phys. Rev. Lett.* **102**, 167201 (2009).
- [84] R. T. Butcher, J. J. Novoa, J. Ribas-Ariño, A. W. Sandvik, M. M. Turnbull, C. P. Landee, Brian M. Wells, and Firas F. Awwadi, Strong through-space two-halide magnetic exchange of -234 K in (2,5-dimethylpyrazine)copper(II) bromide, *Chemical Communications* 2009, 1359 (2009).
- [83] K. H. Höglund and A. W. Sandvik, Edge effects in the two-dimensional spin-1/2 Heisenberg antiferromagnet, *Phys. Rev. B* **79**, (R)020405 (2009).
- [82] A. W. Sandvik, Scale-Renormalized Matrix-Product States for Correlated Quantum Systems *Phys. Rev. Lett.* **101**, 140603 (2008).
- [81] A. W. Sandvik, Quantum Monte Carlo Simulations of Bosonic and Fermionic Impurities in a Two-Dimensional Hard-Core Boson System, *Phys. Rev. Lett.* **101**, 120405 (2008).
- [80] A. W. Sandvik and G. Vidal, Variational Quantum Monte Carlo Simulations with Tensor-Network States, *Phys. Rev. Lett.* **99**, 220602 (2007).

- [79] J. Lou, A. W. Sandvik, and L. Balents, Emergent U(1) symmetry in the 3D XY-model with  $Z_q$  anisotropy, *Phys. Rev. Lett.* **99**, 207203 (2007)
- [78] J. Lou and A. W. Sandvik, Variational ground states of two-dimensional antiferromagnets in the valence bond basis, *Phys. Rev. B* **76**, 104432 (2007).
- [77] K. H. Höglund and A. W. Sandvik, Anomalous Curie response of impurities in quantum-critical spin-1/2 Heisenberg antiferromagnets, *Phys. Rev. Lett.* **99**, 027205 (2007).
- [76] K. S. D. Beach and A. W. Sandvik, Valence bond solid phases in a cubic antiferromagnet, *Phys. Rev. Lett.* **99**, 047202 (2007).
- [75] A. W. Sandvik, Evidence for deconfined quantum criticality in a two-dimensional Heisenberg model with four-spin interactions, *Phys. Rev. Lett.* **98**, 227202 (2007).
- [74] K. H. Höglund, A. W. Sandvik, and S. Sachdev, Impurity induced spin texture in quantum critical 2D antiferromagnets, *Phys. Rev. Lett.* **98**, 087203 (2007).
- [73] D. X. Yao and A. W. Sandvik, Universal Scaling of the Neel Temperature of Near-Quantum-Critical Quasi-Two-Dimensional Heisenberg Antiferromagnets, *Phys. Rev. B* **75** 052411 (2006).
- [72] L. Wang and A. W. Sandvik, Low-energy dynamics of the two-dimensional S=1/2 Heisenberg antiferromagnet on percolating clusters, *Phys. Rev. Lett.* **97**, 117204 (2006).
- [71] K. S. D. Beach and A. W. Sandvik, Some formal results for the valence bond basis, *Nucl. Phys. B* **750**, 142 (2006).
- [70] A. W. Sandvik and R. G. Melko, Ground-state phases and quantum phase transitions in a two-dimensional spin-1/2 XY model with four-spin interactions, *Annals of Physics (N.Y.)* **321**, 1651 (2006).
- [69] A. W. Sandvik, Quantum criticality and percolation in dimer-diluted two-dimensional antiferromagnets, *Phys. Rev. Lett.* **96**, 207201 (2006).
- [68] A. W. Sandvik and R. Moessner, Correlation and confinement in non-planar two-dimensional dimer models, *Phys. Rev. B* **73**, 144504 (2006).
- [67] E. V. Castro, N. M. R. Peres, K. S. D. beach, and A. W. Sandvik, Site dilution of quantum spins in the honeycomb lattice. *Phys. Rev. B* **73**, 054422 (2006).
- [66] L. Wang, K. S. D. Beach, and A. W. Sandvik, High-precision finite-size scaling analysis of the quantum-critical point of S=1/2 Heisenberg antiferromagnetic bilayers, *Phys. Rev. B* **73**, 014431 (2006).
- [64] A. W. Sandvik, Ground state projection of quantum spin systems in the valence bond basis, *Phys. Rev. Lett.* **95**, 207203 (2005).
- [64] R. G. Melko and A. W. Sandvik, Stochastic series expansion algorithm for the S=1/2 XY model with four-site ring exchange, *Phys. Rev. E* **72**, 026702 (2005).
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- [61] K. H. Höglund and A. W. Sandvik, Impurity effects at finite temperature in the two-dimensional S=1/2 Heisenberg antiferromagnet, *Phys. Rev. B* **70**, 024406 (2004).
- [60] A. W. Sandvik, L. Balents, and D. K. Campbell, Ground State Phases of the Half-Filled One-Dimensional Extended Hubbard Model, *Phys. Rev. Lett.* **92**, 236401 (2004).
- [59] N. Laflorencie, D. Poilblanc, and A. W. Sandvik, Magnetic ordering in a doped frustrated spin-Peierls system, *Phys. Rev. B* **69**, 212412 (2004).
- [58] A. W. Sandvik, D. J. Scalapino, and N. E. Bickers, Effect of an electron-phonon interaction on the one-electron spectral weight of a d-wave superconductor, *Phys. Rev. B* **69**, 094523 (2004).



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- [56] R. G. Melko, A. W. Sandvik, and D. J. Scalapino, Aspect-ratio dependence of the spin stiffness of a two-dimensional XY model, *Phys. Rev. B* **69**, 014509 (2004).
- [55] A. W. Sandvik, Stochastic series expansion method for quantum Ising models with arbitrary interactions, *Phys. Rev. E* **68**, 056701 (2003).
- [54] P. Sengupta, A. W. Sandvik, and R. R. P. Singh, Specific heat of quasi-two-dimensional antiferromagnetic Heisenberg models with varying interplanar couplings, *Phys. Rev. B* **68**, 094423 (2003).
- [53] A. W. Sandvik, P. Sengupta, and D. K. Campbell, Comment on “Ground-State Phase Diagram of a Half-Filled One-Dimensional Extended Hubbard Model”, *Phys. Rev. Lett.* **91**, 089701 (2003).
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### Publications in conference proceedings

- [22] Editorial: XXVI IUPAP Conference on Computational Physics (CCP2014), A. W. Sandvik, D. K. Campbell, D. F. Coker, and Y. Tang, *J. Phys.: Conf. Ser.* **640**, 011001 (2015).
- [21] A. Iaizzi and A. W. Sandvik, 1D valence bond solids in a magnetic field, *J. Phys.: Conf. Ser.* **640**, 012043 (2015).
- [20] N.-S. Ma, A. W. Sandvik, and D.-X. Yao, Mott glass phase in a diluted bilayer Heisenberg quantum antiferromagnet, *J. Phys.: Conf. Ser.* **640**, 012045 (2015).
- [19] H. Shao, W. Guo, and A. W. Sandvik, Topological properties of a Valence-Bond-Solid, *J. Phys.: Conf. Ser.* **640**, 012048 (2015).
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- [17] A. W. Sandvik, Computational Studies of Quantum Spin Systems, in *Lectures on the Physics of Strongly Correlated Systems XIV*, proceedings of the 14th Training Course in Physics of Strongly Correlated Systems, edited by A. Avella and F. Mancini, AIP Conference Proceedings **1297**, 135 (2010).
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## Invited Presentations at Conferences and Workshops

- Mini-Workshop on Monte Carlo Methods and Its Applications in Lattice Models, Hefei, China, January 9-10, 2017: *Finite-size scaling at classical and quantum phase transitions*.
- Fourth Workshop on Tensor Network states: Algorithms and Applications, Hsinchu, Taiwan, December 12-15, 2016: *Recent Progress on the Analytic Continuation Problem*.
- Workshop on Correlations, integrability, and criticality in quantum systems, Évora, Portugal, October 24-28, 2016: *Anomalous quantum-criticality with two length scales*.
- 624 WE-Heraeus-Seminar, Simulating Quantum Processes and Devices. Bad Honnef, Germany, September 19-22, 2016: *Quantum annealing in imaginary time*.
- The 75th Okazaki Conference. Tensor Network States: Algorithms and Applications, Okazaki, Japan, January 11-14, 2016: *Unusual finite-size scaling in a system with two divergent length scales*.
- YITP Workshop on Quantum Information Physics, YQIP2016, Kyoto, Japan, January 5-8, 2016: *Quantum annealing in real and imaginary time*.
- NCTS Annual Theory Meeting 2015: Condensed Matter Physics, December 16-19, 2015: *Significance of Two Length Scales at a Deconfined Quantum Critical Point*.
- Gordon Godfrey Workshop on Spins and Strong Electron Correlations, Sydney, Australia, December 2-6, 2015: *Quantum Criticality with Two Length Scales” the case for deconfined quantum-criticality in 2D quantum spin systems*.
- Advances in Diagrammatic Monte Carlo Methods for Quantum Field Theory Calculations in Nuclear, Particle, and Condensed Matter Physics, Trento, Italy October 5-9, 2015: *Exploring Quantum Many-Body Physics with Spin Models*.
- Workshop on Real-time QMC approaches to non-equilibrium problems, Toulouse, France, October 13-14, 2015: *Quantum annealing in real and imaginary time*.
- Workshop of the Middle-European Cooperation on Statistical Mechanics, MECO40, Eszergom, Hungary, March 23-25, 2015: *Quantum Annealing in Imaginary Time*.
- Random Magnets and Quantum Information, Conference in honor of Peter Young, Santa Cruz, California, February 7-8, 2015: *Quantum and classical annealing in spin glasses and quantum computing*.
- Chandrasekhar Lectures and Diskussion Meeting, IISc Bangalore, January 12-16, 2015: *Spinons and holons: aspects of confinement and deconfinement in a two-dimensional valence-bond solid*.
- Workshop on Correlations, Criticality and Coherence in Quantum Systems, Evora, Portugal, October 6-10, 2014: *Computational Studies of Quantum Criticality*.
- Christopher L Henley Symposium, Cornell, September 12, 2014: *Low-energy excitations of percolating quantum spins*.
- Workshop “Numerical and Analytical Methods for Strongly Correlated Systems”, Benasque, Spain, August 24 - September 13, 2014: Two lectures on quantum Monte Carlo simulations and applications  
1) *Stochastic series expansion and ground state projection*, 2) *Non-magnetic and critical states in 2D spin systems*.
- Conference “Quantum Critical Matter—from Atoms to Bulk, QCM14”, Obergurgl, Austria, August 18-23, 2014, *Nonmagnetic and Critical Ground States of 2D Quantum Spin Systems*.
- Field Theoretic Computer Simulations for Particle Physics and Condensed Matter Boston, May 8-10, 2014: *Quantum Monte Carlo Simulations of Deconfined Quantum Criticality*
- Deutsches Physikalische Gesellschaft, Frühjahrstagung, Dresden, March 30 - April 4, 2014. Invited talk: *Quantum Monte Carlo Simulations of Deconfined Quantum Criticality*.
- Conference “From Electrons to Phase Transitions”, Vienna, Austria, February 25-28, 2014: *Quantum Monte Carlo Simulations of Deconfined Quantum Criticality*.

- Taipei Tensor Network Workshop 2013, Taipei, Taiwan, December 2-5, 2013: *Néel to valence-bond-solid transition in two dimensions: Connecting numerics and quantum field theory.*
- Gordon Godfrey Workshop on Spins and Strong Electron Correlations, Sydney, Australia, November 25-29, 2013: *Néel to valence-bond-solid transition in two dimensions: Connecting numerics and quantum field theory.*
- Workshop on Correlations and coherence in quantum systems, Évora, Portugal, October 8-12, 2012: *Exploring quantum fluctuations and quantum phase transitions in spin models.*
- Workshop on Quantum Magnetism, Laboratoire de Physique Théorique, University of Toulouse, France, July 15-22, 2011: *The antiferromagnetic-Valence Bond Solid transition in two dimensions.*
- CSRC Workshop on Advanced Monte Carlo Methods and Stochastic Dynamics, Beijing Computational Science Research Center, Beijing, China, June 20-25, 2011: *Stochastic series expansion method for quantum spin models.*
- Cray-TIFR Workshop on High Performance Computing in Physics, Tata Institute for Fundamental Research, Mumbai, India, February 8-9, 2011. Two invited presentations: (i) *Quantum Monte Carlo studies of a valence-bond-solid state in two dimensions* and (ii) *Quantum Monte Carlo Algorithms for Spin Systems.*
- Program on Disentangling Quantum Many-body Systems: Computational and Conceptual Approaches, Kavli Institute for Theoretical Physics, Santa Barbara, California, Dec. 15, 2010: *Deconfined spinons at the Néel-VBS transition in two dimensions.*
- International Workshop on New Development of Numerical Simulations in Low-Dimensional Quantum Systems, Kyoto, Japan, October 27-29, 2010: *Matrix product states—properties and extensions.*
- Workshop on Density Matrix Renormalization Group and other Advances on Numerical Renormalization Group Methods, Beijing, China, August 23 - September 4, 2010. Two invited presentations: 1) *Variational quantum Monte Carlo with tensor-network states* and 2) *Symmetry breaking and criticality in tensor-product states.*
- International Workshop on Statistical Physics of Quantum Systems, Tokyo, Japan, August 2-4, 2010: *Scaling at the Néel-VBS transition in two dimensions.*
- Workshop on Tensor Networks, Garching, Germany, January 27-30, 2010: *On symmetry breaking in matrix product states.*
- Workshop on Quantum Information Science and Many-Body Physics, Tainan, Taiwan, December 19-20, 2009: *Mechanism of symmetry breaking in matrix-product states.*
- Conference on Computational Physics, Kaohsiung, Taiwan, December 15-19, 2009: *Valence-bond-solid states and quantum phase transitions in two dimensions.*
- 2009 Gordon Godfrey Workshop on “Spin and Strong Correlations”, The University of New South Wales, Sydney, Australia, October 26-29, 2009: *Spinon deconfinement in near-critical quantum antiferromagnets.*
- Fall 2009 meeting of the American Chemical Society, Washington DC, August 16-20, 2009: *Variational quantum Monte Carlo simulations with tensor-network states.*
- Workshop on The Heisenberg Model: Past, Present and Future, International Centre for Condensed Matter Physics, Brasilia, Brazil, July 20-27, 2009: *Valence-bond solid transitions in two-dimensional antiferromagnets.*
- Workshop on “Numerical methods in strongly-correlated quantum systems 2009”, National Taiwan University, Taipei, Taiwan, May 23, 2009:  *$SU(2)$  and  $SU(N)$  symmetric valence-bond solid states and their quantum phase transitions.*
- Supercomputing in Solid State Physics 2009, Institute for Solid State Physics, The University of Tokyo, Japan, February 16-19, 2009: *Valence-bond solid transitions in two-dimensional quantum antiferromagnets.*

- Numerical Approaches to Quantum Many-Body Systems, Institute for Pure and Applied Mathematics, University of California, Los Angeles, January 22-30, 2009: Tutorial *Introduction to quantum Monte Carlo—the stochastic series expansion method* and research presentation *Quantum Monte Carlo simulations in the valence bond basis*.
- Unconventional Phases and Phase Transitions in Strongly Correlated Electron Systems, Max Planck Institute for Complex Systems, Dresden Germany, June 4-7, 2008: *Quantum fluctuations in near-critical valence-bond-solids*.
- Quantum Monte Carlo simulation and its application in statistical physics, Institute of Physics, Chinese Academy of Science, Beijing, February 26, 2008: *Variational Monte Carlo simulations with tensor-network states*.
- Tensor network methods and entanglement in quantum many-body systems, Erwin Schrödinger Institute for Mathematical Physics, February 16-19, 2008: *Variational Monte Carlo simulations with MPS and related tensor-network states*.
- Thouless Theoretical Physics Mini-workshop: Super-matters and Novel Transports, National Taiwan University, Taipei, October 19-20, 2007: *Antiferromagnetic to valence-bond-solid transition in two dimensions—the case for “deconfined” quantum criticality*.
- Gordon Godfrey Workshop on Strong Electron Correlations, University of New South Wales, Sydney, Australia, September 24-27, 2007: *Quantum Monte Carlo Study of a “Deconfined” Quantum Critical Point*.
- Spin and charge flow in nanostructures, Centre for Advanced Study, Oslo, Norway, June 27-30, 2007, *Deconfined quantum-critical point in a 2D Heisenberg model with four-spin interactions*.
- KITP Conference: Strongly Correlated Phases in Condensed Matter and Degenerate Atomic Systems, Santa Barbara, California, April 23-27, 2007: *Quantum Monte Carlo Studies of Deconfined Quantum-Criticality*.
- Computer Simulations in Condensed Matter Physics XX, University of Georgia, Athens, Georgia, February 19, 2007: *Simulating quantum spins in the valence bond basis*.
- Numerical Methods in Strongly Correlated Systems, National Taiwan University, Taipei, August 28-30, 2006: Two presentations: 1) *Simulations of quantum spin systems in the valence bond basis*, 2) *Valence-bond solid phase and quantum phase transition in a Heisenberg model with 4-spin interactions*.
- International Conference of Magnetism, Kyoto, Japan, August 20-25, 2006: *Quantum Monte Carlo in the valence bond basis; a study of deconfined quantum criticality in a 2d antiferromagnet with four-spin interactions*.
- Computational Approaches to Quantum Critical Phenomena, Workshop and Symposium, ISSP, University of Tokyo, July 17 - August 11, 2006: Three presentations: 1) *The stochastic series expansion method*, 2) *Quantum Monte Carlo simulation in the valence bond basis*, 3) *Deconfined quantum criticality in a 2D Heisenberg model with 4-spin interactions*.
- The Croucher Foundation—Advanced Study Institute, conference on Frontiers in Computational Methods and their Applications in Physical Sciences, The Chinese University of Hong Kong, Sha-Tin, Hong-Kong, December 6-12, 2005: *Quantum Monte Carlo simulation in the valence-bond basis*.
- The Canadian Institute for Advanced Research, meeting on Quantum Materials, Waterloo, Ontario, Canada, November 17-20, 2005: *Nature of the transition from antiferromagnet to valence-bond-solid*.
- Workshop on Effective Models for Low-Dimensional Strongly Correlated Systems, Peyresq, France, September 12-16, 2005: *Superfluid to valence-bond-solid transition in a 2D hard-core boson model with four-particle exchange and an  $O(3)$ -symmetric model with a Néel to valence-bond-solid transition*.
- Mottness and Quantum Criticality Workshop, Tobago, West Indies, June 8-19, 2005: *Superfluid to valence-bond-solid transition in a 2D hard-core boson model with four-particle exchange*.
- Workshop on Quantum cluster methods for correlated materials, Sheerbrooke, Quebec, Canada, July 6-8, 2005: *Stochastic analytic continuation*.

- 30-th Conference on the Middle European Cooperation in Statistical Physics, Cortona, Italy, April 3-6, 2005: *Superfluid to VBS quantum phase transition in a 2D hard-core boson model with four-particle exchange.*
- March Meeting of the American Physical Society, Los Angeles, California, March 21-25, 2005: *Magnetic to valence-bond-solid transition in an  $S=1/2$  XY model with ring exchange.*
- Sixth Annual Greater Boston Area Statistical Mechanics Meeting, Brandeis University, October 16, 2004: *Phase transitions in diluted 2D quantum antiferromagnets.*
- KITP Conference: Exotic Order and Criticality in Quantum Matter, Santa Barbara, California, June 7-11, 2004: *Quantum-Criticality in diluted 2D antiferromagnets.*
- The Monte Carlo Method in the Physical Sciences, Celebrating the 50th anniversary of the Metropolis algorithm, Los Alamos, June 9-11, 2003: *The directed-loop algorithm.*
- March Meeting of the American Physical Society, Austin, Texas, March 3-7, 2003: *Directed loop algorithm for quantum Monte Carlo simulations.*
- WE-Heraeus Seminar, "Quantum Magnetism: Microscopic Techniques for Novel States of Matter", Bad Honnef, Germany, November 4-6, 2002: *Classical and quantum phase transitions in randomly diluted 2D antiferromagnets.*
- March Meeting of the American Physical Society, Indianapolis, Indiana, March 18-22, 2002: *Randomly diluted  $S=1/2$  Heisenberg antiferromagnet on the bilayer square lattice.*
- European Science Foundation Workshop on "Quantum disordered systems, glassy low-temperature physics, and physics at the glass transition", Heidelberg, Germany, Feb. 26-Mar. 2, 2002: *Phase transitions in diluted two-dimensional quantum antiferromagnets.*
- International Workshop on "Order, Disorder, and Dynamics in Quantum Spin Systems", Yukawa Institute for Theoretical Physics, Kyoto, Japan, November 15-16, 2001: *Finite-size scaling in the 2D Heisenberg model with non-magnetic impurities.*
- International Workshop on Materials Simulation, Shonan, Japan, November 7-10, 2001: *Application of the stochastic series expansion method to disordered systems.*
- Euroconference "Transport and dynamics in complex electronic materials", Porto, Portugal, 3-7 September, 2001: *High-energy spin dynamics in the two-dimensional Heisenberg antiferromagnet.*
- Mini Workshop on "Charge and spin transport and non-linear phenomena", University of Aveiro, Portugal, April 10-12, 2001. Three lectures: 1) *Path integral and stochastic series expansion quantum Monte Carlo methods* 2) *Monte Carlo studies of quantum phase transitions* 3) *Quantum Monte Carlo simulations of the diluted two-dimensional Heisenberg model.*
- March Meeting of the American Physical Society, Minneapolis, Minnesota, March 20-24, 2000: *Advances in quantum Monte Carlo for quantum critical systems.*
- ITP Conference on "Quantum Magnetism", Santa Barbara, California, August 16-20, 1999: *Multi-chain mean-field theory and quantum Monte Carlo simulations of the quasi-1D Heisenberg model.*
- CECAM workshop on "Advances in numerical methods for correlated lattice systems", Lyon, France, July 27-31, 1999: *Recent developments of the Stochastic Series Expansion method.*
- Euroconference on "Interactions and Correlations in Low-Dimensional Systems", Villa Gualino, Torino, Italy, May 1996: *Phase separation and superconductivity in a one-dimensional CuO model.*

### Other Invited Presentations

- School of Physics, Sun Yat-Sen University, Guangzhou, China. Colloquium, January 13, 2017: *Recent Progress on the Analytic Continuation Problem.*
- Beijing Normal University, Beijing, China. Seminar, June 14, 2016: *Spectral functions and analytic continuation of quantum Monte Carlo data.*



- Capital Normal University, Beijing, China. Seminar, June 13, 2016: *New perspectives on deconfined quantum criticality.*
- Institute of Physics, Chinese Academy of Sciences, Beijing, China. Seminar, June 7, 2016: *New perspectives on deconfined quantum criticality.*
- Beijing Computational Science Research Center, Beijing, China. Lecture, May 24, 2016: *Stochastic analytic continuation.*
- McMaster University, Hamilton, Ontario. Physics colloquium, November 18, 2015: *Significance of Two Length Scales at a Deconfined Quantum Critical Point.*
- Beijing Normal University. Physics colloquium, June 17, 2015: *Quantum annealing in spin glasses and quantum computing.*
- National Taiwan University, Department of Physics. Colloquium, March 10, 2015: *Quantum and classical annealing in spin glasses and quantum computing.*
- Nanyang Technological University, Department of Physics. Seminar January 26, 2015: *Quantum and classical annealing in spin glasses and quantum computing.*
- Tata Institute for Fundamental Research, Mumbai, India. Seminar, January 21, 2015: *Quantum and classical annealing in spin glasses and quantum computing.*
- Beijing Computational Science Research Center, Beijing, China. Colloquium, December 2, 2014: *Quantum and classical annealing in spin glasses and quantum computing.*
- Institute of Physics, Chinese Academy of Sciences, Beijing, China. Colloquium, November 26, 2014: *Quantum and classical annealing in spin glasses and quantum computing.*
- Institute of Physics, Chinese Academy of Sciences, Beijing, China. Lecture series (6 hours), October–November, 2014: *Introduction to quantum spin systems and quantum Monte Carlo simulations* (3 hours) and *Criticality in classical and quantum magnets* (3 hours).
- School of Physics, University of New South Wales, Sydney, Australia, Seminar, January 9, 2014 *Quantum Monte Carlo calculations of gaps and velocities in quantum spin systems.*
- School of Physics and Engineering, Sun Yat-Sen University, Guangzhou, China, Physics Colloquium, October 14, 2013: *Scaling at phase transitions approached through non-equilibrium dynamics.*
- International Center for Quantum Materials, Beijing University, Seminar, June 20, 2013: *Bridging lattice-scale physics and continuum field theory with quantum Monte Carlo simulations.*
- Department of Physics, Beijing Normal University, Beijing, China, Seminar, June 18, 2013: *Bridging lattice-scale physics and continuum field theory with quantum Monte Carlo simulations.*
- Department of Physics, Harvard University, Condensed Matter Seminar, October 18, 2012: *Monte Carlo simulations of quantum-quench dynamics.*
- School of Physics and Engineering, Sun Yat-Sen University, Guangzhou, China, Physics Colloquium, June 6, 2013: *Bridging lattice-scale physics and continuum field theory with quantum Monte Carlo simulations.*
- Department of Physics, University of Sherbrooke, Quebec, Canada, Seminar, September 25, 2012: *Bridging lattice-scale physics and continuum field theory with quantum Monte Carlo simulations.*
- Department of Physics, University of Alberta, Edmonton, Canada, Seminar, August 7, 2012: *Bridging lattice-scale physics and continuum field theory with quantum Monte Carlo simulations.*
- Department of Physics, National Taiwan University, Theory Seminar, June 13, 2012: *Bridging lattice-scale physics and continuum field theory with quantum Monte Carlo simulations.*
- Abdus Salam International Center for Theoretical Physics (ICTP), Trieste, Italy. Seminar, February 2, 2012: *2D Spin Liquids Found?*
- Department of Physics, National Taiwan University, Condensed Matter Seminar, January 4 30, 2012: *Spin Liquid Found?*

- Los Alamos National Laboratory, Los Alamos, New Mexico, Condensed Matter Colloquium, November 30, 2011: *Quantum Monte Carlo simulations of deconfined quantum criticality*.
- School of Physics and Engineering, Sun Yat-Sen University, Guangzhou, China. Condensed matter seminar, June 21, 2011: *Deconfined spinons at the Neel-VBS transition in two dimensions*.
- College of Physics and Technology, Shenzhen University, China. Condensed matter seminar, June 20, 2011: *Deconfined spinons at the Neel-VBS transition in two dimensions*.
- Department of Physics, National University of Singapore. Condensed matter seminar, June 15, 2011: *Deconfined spinons at the Neel-VBS transition in two dimensions*.
- Department of Physics, Indian Institute of Science, Bangalore, India. Seminar, February 13, 2011: *Deconfined spinons in a quantum-critical 2D antiferromagnet*.
- Tata Institute for Fundamental Research, Mumbai, India. Seminar, February 10, 2011: *Deconfined spinons in a quantum-critical 2D antiferromagnet*.
- Department of Physics, National Taiwan Normal University, Taipei, Taiwan. Seminar, January 12, 2011: *Ground state order and criticality in quantum spin systems*.
- Department of Physics, National Taiwan University, Taipei, Taiwan. Seminar, January 6, 2011: *Deconfined spinons in a 2D quantum-critical antiferromagnet*.
- Center for Computational Science, University of Kentucky, Lexington, Kentucky. Seminar, December 2, 2010: *Ground State Order and Criticality in Quantum Spin Systems*.
- Department of Physics, University of Kentucky, Lexington, Kentucky. Condensed Matter Seminar, December 1, 2010: *Deconfined spinons at the Neel-VBS transition in two dimensions*.
- Department of Physics, University of Vermont, Burlington, Vermont. Colloquium, November 10, 2010: *Ground State Order and Criticality in Quantum Spin Systems*.
- Yukawa Institute for Theoretical Physics, Kyoto, Japan. Condensed Matter Seminar, October 25, 2010: *Deconfined spinons at the Neel-VBS transition in two dimensions*.
- Department of Physics, Massachusetts Institute of Technology. “Chez Pierre” Condensed Matter Physics Seminar, October 4, 2010: *Deconfined spinons at the Neel-VBS transition in two dimensions*.
- School of Physics, Nankai University, Tienjin, China. Colloquium, August 20, 2010: *Exploring quantum phase transitions in spin systems*.
- School of Physics and Engineering, Sun Yat-sen University, Guangzhou, China. Two lectures June 18, 2010: *Numerical diagonalization studies of quantum spin chains*.
- School of Physics and Engineering, Sun Yat-sen University, Guangzhou, China. Colloquium, June 17, 2010: *Exploring quantum phase transitions in spin systems*.
- Institute for Applied Physics, National Cheng-chi University, Taipei, Taiwan. Seminar, January 4, 2010: *Computer simulations of phase transitions - an elementary introduction*.
- Department of Physics, Yale University, New Haven, Connecticut. Condensed matter seminar, September 24, 2009: *Evidence for deconfined quantum-criticality in a class of extended Heisenberg models*.
- Department of Physics, National Taiwan University, Taipei, Taiwan. Two special lectures, May 21, 2009: *Introduction to one-dimensional quantum spin systems*.
- Department of Physics, Mississippi State University, Starkville, Mississippi. Physics colloquium, April 22, 2009: *Exploring quantum phase transitions with spin systems*.
- National High Magnetic Field Laboratory, Florida State University, Tallahassee, Florida, seminar, March 27, 2009: *Valence-bond-solid states in two-dimensional quantum spin systems*.
- School of Physics, University of New South Wales, Sydney, Australia, theoretical seminar, December 16, 2008: *Renormalization method for tensor-network states*.
- Microsoft Research, Station Q, Santa Barbara, California, seminar, November 25, 2008: *Modeling correlated quantum systems with tensor-network states*.

- Department of Physics, Purdue University, West Lafayette, Indiana. Condensed matter seminar, November 14, 2008: *Valence-bond-solid states in two-dimensional quantum antiferromagnets.*
- Department of Physics, National Taiwan University, Taipei, Taiwan. Seminar, August 6, 2008: *Valence-bond-solid states in two-dimensional quantum spin systems.*
- Institute of Theoretical Physics, University of Leipzig, Germany. Seminar, June 17, 2008: *Quantum fluctuations in near-critical valence-bond-solids.*
- Institute of Solid State Physics, the University of Tokyo, Japan. Theory Division seminar, March 7, 2008: *Variational quantum Monte Carlo simulations with tensor-network states.*
- Department of Physics, Renmin University of China, Beijing. Theory seminar, February 28, 2008: *Néel to valence-bond-solid transition in a two-dimensional quantum spin model.*
- Department of Physics, Beijing Normal University, Theory seminar, February 28, 2008: *Néel to valence-bond-solid transition in a two-dimensional quantum spin model.*
- Institute of Physics, Chinese Academy of Science, Beijing. Zhong Guan Cun Forum on Condensed Matter Physics, No. 119, February 27, 2008: *Néel to valence-bond-solid transition in a two-dimensional quantum spin model.*
- Department of Physics, National Taiwan University, Taipei, Taiwan. Physics colloquium, October 23, 2007: *Order and fluctuations in quantum spin systems.*
- Department of Physics, National Cheng-Kung University, Tainan, Taiwan. Theoretical physics seminar, October 11, 2007: *Order and fluctuations in quantum spin systems.*
- Institute of Physics, Academia Sinica, Taipei, Taiwan. Seminar, October 9, 2007: *Quantum Monte Carlo study of a “deconfined” quantum critical point.*
- Department of Physics, National Tsing Hua University, Hsinchu, Taiwan. Seminar, September 5, 2007: *Quantum Monte Carlo studies of deconfined quantum criticality.*
- Department of Physics, Tunghai University, Taichung, Taiwan. Theory seminar, August 28, 2007: *Quantum Monte Carlo study of a “deconfined” quantum critical point.*
- School of Physical Science, University of Queensland, Australia. Condensed matter seminar, June 8, 2007: *Simulating quantum spin systems in the valence bond basis*, Quantum Science Seminar, June 11, 2007: *Deconfined quantum-critical point in a 2D Heisenberg model with four-spin couplings.*
- Materials Science and Technology Division, Oak Ridge National Laboratory, Tennessee. Materials theory seminar, May 17, 2007: *Monte Carlo simulations of quantum spins in the valence bond basis.*
- Department of Physics, University of California, Los Angeles. Condensed matter theory seminar, February 21, 2007: *Possible deconfined quantum-critical point in a 2D Heisenberg antiferromagnet with 4-spin interactions.*
- Department of Physics, Technical University of Graz, Austria. Condensed matter theory seminar, June 21, 2006: *Deconfined quantum-criticality in a Heisenberg model with 4-spin interactions; Quantum Monte Carlo in the valence bond basis*
- Department of Physics, Massachusetts Institute of Technology, Boston, Massachusetts. Condensed matter theory seminar, April 26, 2006: *Valence-bond-solid phases and quantum phase transitions in two-dimensional antiferromagnets*
- Department of Physics, Cornell University, Ithaca, New York. Theory seminar, April 11, 2006: *The transition from antiferromagnet to valence bond solid in two dimensions.*
- Department of Physics and Astronomy, University of British Columbia, Vancouver, Canada. Theory seminar, January 20, 2006: *Deconfined quantum-critical point in a 2D Heisenberg model with four-spin interactions.*
- Department of Chemistry, Boston University. Physical chemistry seminar, May 4, 2005: *Stochastic series expansion — an efficient alternative to path integrals in lattice quantum Monte Carlo simulations.*

- Department of Physics, University of Illinois at Urbana-Champaign. Theory seminar, February 14, 2005: *Superfluid to VBS quantum phase transition in a 2D hard-core boson model with 4-particle exchange.*
- Department of Physics, The Ohio State University, Columbus, Ohio. Condensed matter theory seminar, November 8, 2004: *Ground state phases of the one-dimensional extended Hubbard model.*
- Physics Department, University of Massachusetts, Amherst, Condensed matter seminar, October 28, 2004: *Ground state phases of the 1D extended Hubbard model.*
- Department of Physics, University of California, Irvine, Condensed matter seminar, June 4, 2003: *Phase diagram of the one-dimensional extended Hubbard model.*
- Department of Physics and Astronomy, University of Southern California, Los Angeles, Condensed matter seminar, May 27, 2003: *Phase diagram of the one-dimensional extended Hubbard model.*
- Perimeter Institute, Waterloo, Canada, Theory seminar, May 21, 2003: *Monte Carlo simulations of quantum antiferromagnets.*
- Department of Physics, University of Waterloo, Canada, Colloquium, May 20, 2003: *Phase transitions in quantum antiferromagnets.*
- Department of Physics, Boston University, Condensed matter seminar, May 5, 2003: *Monte Carlo simulations of quantum antiferromagnets.*
- Department of Physics, University of California, San Diego, Condensed matter physics seminar, April 17, 2003: *Classical and quantum phase transitions in two-dimensional antiferromagnets.*
- Department of Physics, University of California, Santa Cruz, Condensed matter seminar, March 14, 2003: *The bond-order phase of the one-dimensional extended Hubbard model.*
- Institut für Theoretische Physik, Eidgenössige Technische Hochschule, Zürich, Switzerland. Condensed matter seminar, November 12, 2002: *Quantum Monte Carlo simulations of a two-dimensional XY-model with 4-spin interactions.*
- Theoretische Physik, Universität des Saarlandes, Saarbrücken, Germany. Theory Colloquium, Feb. 20, 2002: *Ground state properties of the diluted two-dimensional Heisenberg antiferromagnet.*
- Physics Department, Boston University, Boston, Massachusetts. Condensed matter seminar, Feb. 8, 2002: *Ground state properties of the diluted two-dimensional Heisenberg antiferromagnet.*
- Nordic Institute for Theoretical Physics (NORDITA), Copenhagen, Denmark, October 5, 2001. Condensed matter seminar: *The diluted two-dimensional Heisenberg antiferromagnet.*
- Centro de Física, Universidade do Minho, Braga, Portugal. Seminar, September 19, 2001: *Non-magnetic impurities in two-dimensional antiferromagnets.*
- Institut für Theoretische Physik, Eidgenössige Technische Hochschule, Zürich, Switzerland. Seminar, May 31, 2001: *Quantum Monte Carlo simulations of the diluted two-dimensional Heisenberg model.*
- Hahn-Meitner Institut, Berlin, Germany. Seminar, May 22, 2001: *Quantum Monte Carlo simulations of the diluted two-dimensional Heisenberg model.*
- Department of Physics, University of California, Davis. Condensed matter seminar, Mar. 8, 2001: *Quantum Monte Carlo simulations of the diluted two-dimensional Heisenberg model.*
- Laboratory of Physics, Helsinki University of Technology, Finland. Seminar, Feb. 1, 2001: *Quantum Monte Carlo simulations of the diluted two-dimensional Heisenberg model.*
- School of Physics, The University of New South Wales, Sydney, Australia. Theoretical seminar, Nov. 14, 2000: *Quantum Monte Carlo simulations of the diluted two-dimensional Heisenberg model.*
- Department of Physics, Hong Kong Baptist University, Hong Kong, Seminar, Jan. 13, 1999: *The stochastic series expansion method.*
- School of Physics, The University of New South Wales, Sydney, Australia, Theoretical Seminar, Dec. 14, 1998: *Finite-frequency phonons in the Heisenberg spin chain.*

- International School for Advanced Studies (SISSA), Trieste, Italy. Seminar, July 11, 1998: *Recent advances in the stochastic series expansion quantum Monte Carlo method.*
- Institut Romand de Recherche Numérique en Physique des Matériaux (IRRMA), Lausanne, Switzerland. Seminar, June 24, 1998: *Nature of the cross-over from quantum to classical order-parameter fluctuations at finite-temperature phase transitions.*
- Department of Physics, University of Arizona, Tucson. Department Colloquium, Jan. 30, 1998: *Spin dynamics in two-dimensional quantum antiferromagnets.*
- Department of Physics, University of Southern California, Los Angeles. Department Colloquium, Dec. 1, 1997: *Spin dynamics in two-dimensional quantum antiferromagnets.*
- Department of Physics, Indiana University, Bloomington. Condensed Matter Seminar, Feb. 21, 1997: *Quantum Monte Carlo calculations of NMR relaxation rates for low-dimensional antiferromagnets.*
- Department of Physics, University of California, Davis. Condensed Matter Seminar, Jan. 23, 1997: *Numerical results for the Raman line shape of the 2D Heisenberg model.*
- Physikalisches Institut, Universität Würzburg, Germany. Condensed Matter Theory Seminar, May 1996: *Phase separation and superconductivity in a one-dimensional CuO model.*
- Department of Physics, University of Bonn, Germany. Condensed Matter Theory Seminar, May 1996: *Phase separation and superconductivity in a one-dimensional CuO model.*
- National High Magnetic Field Laboratory, Florida State University. Condensed Matter Seminar, June 8 1994: *Quantum phase transitions in two-dimensional antiferromagnets.*
- Department of Physics, University of California, Irvine. Condensed Matter Seminar, Feb. 7, 1994: *A generalization of Handscomb's quantum Monte Carlo technique, and some recent applications.*