

Numerical Approaches to Quantum Many-Body Systems

Thursday January 22, 2009

- 7:00–8:00 *QS2009 Tutorials*
- 8:00–9:00 *Check-In/Light Breakfast (Hosted by IPAM)*
- 9:00–10:15 **Werner Krauth** (École Normale Supérieure)
Lecture: Introduction to Monte Carlo
- 10:15–10:30 *Break*
- 10:30–11:45 **Anders Sandvik** (Boston University)
Lecture: Introduction to Quantum Monte Carlo
- 11:45–12:00 *Break*
- 12:00–12:45 **Matthias Troyer** (ETH Zürich)
Lecture: QMC and Sign Problem
- 12:45–2:15 *Lunch (on your own)*
- 2:15–2:45 **Matthias Troyer** (ETH Zürich)
Lecture: Introduction to ALPS
- 2:45–3:00 *Break*
- 3:00–6:00 **Matthias Troyer** (ETH Zürich)
Hands-On: ALPS Installation, Classical Monte Carlo

Friday January 23, 2009

- 7:00–8:00 *QS2009 Tutorials*
- 8:15–9:00 *Continental Breakfast*
- 9:00–10:15 **Thomas Schulthess** (Swiss Federal Institute of Technology of Zurich)
Lecture: High-Performance Computing
- 10:15–10:30 *Break*
- 10:30–11:45 **Andreas Läuchli** (Max-Planck-Institut für Physik Komplexer Systeme)
Lecture: Introduction to Exact Diagonalization
- 11:45–12:00 *Break*

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- 12:00–12:45 **Simon Trebst** (Microsoft Station Q)
Lecture: Series Expansions
- 12:45–2:00 *Lunch (on your own)*
- 2:00–2:45 **Nikolay Prokof'ev** (University of Massachusetts Amherst)
Lecture: Continuous-Time QMC (worms)
- 2:45–3:00 *Break*
- 3:00–6:00 **Andreas Läuchli** (Max-Planck-Institut für Physik Komplexer Systeme)
Hands-On: Exact Diagonalization

Saturday January 24, 2009

- 7:00–8:00 *QS2009 Tutorials*
- 8:15–9:00 *Continental Breakfast*
- 9:00–10:15 **Steve White** (University of California, Irvine (UCI))
Lecture: Introduction to DMRG
- 10:15–10:30 *Break*
- 10:30–11:45 **Ulrich Schollwöck** (RWTH Aachen)
Lecture: Time-Dependent DMRG
- 11:45–12:00 *Break*
- 12:00–12:45 **Guifre Vidal** (University of Queensland)
Lecture: Tensor Networks
- 12:45–2:15 *Lunch (on your own)*
- 2:15–2:45 **Guifre Vidal** (University of Queensland)
Lecture: Entanglement Renormalization
- 2:45–3:00 *Break*
- 3:00–6:00 **Fakher Assaad** (Bayerische-Julius-Maximilians-Universität Würzburg)
Hands-On: QMC or DMRG

Monday January 26, 2009

- 7:00–8:00 QS2009 Workshop <p>Morning Session Chair: Simon Trebst, Afternoon Session Chair: Alexander Lichtenstein
- 8:15–9:00 Check-In/Light Breakfast (Hosted by IPAM)
- 9:00–9:50 **Uwe-Jens Wiese** (University of Bern - Institute for Theoretical Physics)
Meron-Cluster and Nested Cluster Algorithms: Addressing the Sign Problem in Quantum Monte Carlo Simulations
- 10:00–10:15 Break
- 10:15–11:05 **Nikolay Prokof'ev** (University of Massachusetts Amherst)
Diagrammatic Monte Carlo: What Happens to the Sign-Problem?
- 11:15–11:30 Break
- 11:30–12:20 **Fakher Assaad** (Bayerische-Julius-Maximilians-Universität Würzburg)
Weak Coupling CT-QMC, Projective Schemes and Its Application to the Electron-Phonon Problem
- 12:30–2:30 Lunch (on your own)
- 2:30–3:20 **Olivier Parcollet** (Commissariat à l'Énergie Atomique (CEA) - Centre d'Études Nucléaires de Saclay (CENS))
DMFT and Beyond: From Quantum Impurities to High Temperature Superconductors
- 3:30–4:00 Break
- 4:00–4:50 **Philipp Werner** (ETH Zürich)
Diagrammatic Monte Carlo Simulation of Impurity Models
- 5:00–7:00 Poster Session & Reception (Hosted by IPAM)

Tuesday January 27, 2009

- 7:00–8:00 QS2009 Workshop <p>Morning Session Chair: Philipp Werner, Afternoon Session Chair: Steve White
- 8:15–9:00 Continental Breakfast
- 9:00–9:50 **Alexander Lichtenstein** (Universität Hamburg)
Non-local Correlations in Electronic Structure Scheme: Beyond DMFT
- 10:00–10:15 Break
- 10:15–11:05 **Hartmut Monien** (Rheinische Friedrich-Wilhelms-Universität Bonn)
From Random Matrix Theory to Optimal Frequency Grids
- 11:15–11:30 Break

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- 11:30–12:20 **Rajiv Singh** (University of California, Davis (UC Davis))
Linked-Cluster Series-Expansion Methods for Quantum Lattice Models
- 12:30–2:30 *Lunch (on your own)*
- 2:30–3:20 **Andreas Läuchli** (Max-Planck-Institut für Physik Komplexer Systeme)
Exact Diagonalization: A Smart Tool to Study New States of Quantum Matter
- 3:30–4:00 *Break*
- 4:00–4:50 **Didier Poilblanc** (Université de Toulouse III (Paul Sabatier))
Simulations of Quantum Dimer Models

Wednesday January 28, 2009

- 7:00–8:00 *QS2009 Workshop* <p>Morning Session Chair: *Guifre Vidal*, Afternoon Session Chair: *Ulrich Schollwöck*
- 8:15–9:00 *Continental Breakfast*
- 9:00–9:50 **Steve White** (University of California, Irvine (UCI))
Traditional DMRG Approaches for 2D Frustrated and Doped Quantum Systems
- 10:00–10:15 *Break*
- 10:15–11:05 **Frank Verstraete** (Universität Wien)
Projected Entangled Pair States: Status and Prospects
- 11:15–11:30 *Break*
- 11:30–12:20 **Roman Orus** (University of Queensland)
Progress on Infinite TPS/PEPS Algorithms
- 12:30–2:00 *Lunch (on your own)*
- 2:00–2:50 **Sandy Irani** (University of California, Irvine (UCI))
Ground State Complexity in One Dimensional Quantum Systems
- 3:00–3:15 *Break*
- 3:15–4:05 **Guifre Vidal** (University of Queensland)
Recent Progress in Entanglement Renormalization
- 4:15–4:30 *Break*
- 4:30–5:20 **Ian McCulloch** (University of Queensland)
Matrix Product States, Operators, and the Thermodynamic Limit of DMRG

Thursday January 29, 2009

- 7:00–8:00 *QS2009 Workshop*
Morning/Afternoon Sessions Chair: Matthias Troyer
- 8:15–9:00 *Continental Breakfast*
- 9:00–9:50 **Anders Sandvik** (Boston University)
Quantum Monte Carlo Simulations in the Valence-Bond Basis
- 10:00–10:15 *Break*
- 10:15–11:05 **Kevin Beach** (University of Alberta)
Valence Bond Quantum Monte Carlo Methods
- 11:15–11:30 *Break*
- 11:30–12:20 **Norbert Schuch** (Max-Planck-Institut für Quantenoptik)
Quantum Simulation with String-Bond States: Joining PEPS and Monte Carlo
- 12:30–2:30 *Lunch (on your own)*
- 2:30–3:20 **Simon Trebst** (Microsoft Station Q)
Optimized Extended Ensembles for Slowly Equilibrating Classical and Quantum Systems
- 3:30–4:00 *Break*
- 4:00–5:00 *Physics Department Colloquium, Matthias Troyer*
1-425 Physics and Astronomy

Friday January 30, 2009

- 7:00–8:00 *QS2009 Workshop*
Morning Session Chair: Hartmut Monien, Afternoon Session Chair: Werner Krauth
- 8:15–9:00 *Continental Breakfast*
- 9:00–9:50 **Corinna Kollath** (École Polytechnique)
Quantum Dynamics and Strong Correlations with Cold Atomic Gases
- 10:00–10:15 *Break*
- 10:15–11:05 **Matthias Troyer** (ETH Zürich)
Calculating Entropy in Monte Carlo Simulations
- 11:15–11:30 *Break*

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- 11:30–12:20 **Werner Krauth** (École Normale Supérieure)
Kosterlitz-Thouless Transition of the Quasi-Two-Dimensional Trapped Bose Gas
- 12:30–2:00 *Lunch (on your own)*
- 2:00–2:50 **Thomas Maier** (Oak Ridge National Laboratory)
Dynamic Cluster Quantum Monte Carlo Simulations of Cuprate Superconductors
- 3:00–3:30 *Break*
- 3:30–4:20 **Matthew Fisher** (University of California, Santa Barbara (UC Santa Barbara))
Circumnavigating the Sign Problem in 2D Spin, Bose and Non-Fermi Liquid Metals
- 4:20–4:50 **Ulrich Schollwöck** (RWTH Aachen)
Closing Remarks

