

Univ.-Prof. Dr. sc. nat. Andreas Läuchli  
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Born February 8th, 1972  
Swiss citizen

Married, three children

German, mother tongue  
French, fluent  
English, fluent

## Curriculum Vitae Andreas Läuchli

### Education and Professional Activity

- 3/2011 - present Full professor (tenured) of Theoretical Physics at the University of Innsbruck.
- 3/2013 - 2-2017 Head of the Institute for Theoretical Physics at the University of Innsbruck.
- 9/2008 - 8/2011 Leader of the research group *New states of quantum matter*,  
Max Planck Institut für Physik komplexer Systeme, Dresden, Germany
- 3/2006 - 8/2008 Lecturer (Chargé de cours) for “Computational Physics I/II”  
at the Ecole Polytechnique Fédérale de Lausanne, Switzerland (EPFL)
- 9/2004 - 8/2008 Project leader of the activity  
*Numerical Investigation of Strongly Correlated Systems* at the  
Institut Romand de Recherche Numérique en Physique des Matériaux (IRRMA)  
at the Ecole Polytechnique Fédérale de Lausanne, Switzerland (EPFL).  
Coordinators: Prof. F. Mila (EPFL) and Prof. T. Giamarchi (Uni Genève).
- 12/2002 - 8/2004 Post-doc with Prof. D. Poilblanc, Laboratoire de Physique Théorique,  
Université Paul Sabatier, Toulouse, France  
Supported by a Swiss National Science Foundation  
fellowship and by the CNRS as a chercheur associé.
- 4/1999 - 11/2002 Dr. sc. nat. ETH,  
PhD thesis: *Quantum Magnetism and Strongly Correlated Electrons in Low Dimensions*  
with Prof. T.M. Rice and Prof. M. Troyer,  
distinguished with an ETH silver medal for outstanding PhD theses.
- 3/1999 Dipl. Phys. ETH, Diploma with distinction  
Diploma Thesis: *Magnon Dispersion in doped Spin Liquids*  
with Prof. T.M. Rice and Dr. M. Troyer
- 10/1996 - 3/1999 Diploma studies in Theoretical Physics, ETH Zürich
- 6/1996 - 9/1996 Officer School (second part)
- 9/1995 - 5/1996 Exchange Student at the Ecole Normale Supérieure in Paris
- 10/1993 - 7/1995 Diploma studies in Physics, ETH Zürich
- 2/1992 - 5/1993 Military Training School and Officer School (first part)
- 1/1992 Matura Typus C, Alte Kantonsschule Aarau, Switzerland

## Research Interests

Our group is interested in the theoretical and computational exploration of correlated quantum matter in condensed matter and atomic and molecular systems. We strive to understand novel phases of matter, quantum critical phenomena and quantum systems out of equilibrium. Our research builds on a blend of concepts and ideas from condensed matter theory, statistical mechanics, quantum field theory and quantum information. We also develop and implement innovative computational algorithms in order to perform large-scale computer simulations on high-performance computers.

## Honours

### *Fellowships*

2019-2021	Visiting Fellow, Perimeter Institute for Theoretical Physics, Waterloo, Canada
5/2006	Gordon Godfrey Visiting Fellow, School of Physics, University of New South Wales, Sydney
6/2003-5/2004	Postdoctoral Fellowship of the Swiss National Fund

### *Distinctions*

9/2003	ETH Zürich, Silver medal for outstanding PhD theses
4/1999	ETH Zürich, Diploma with distinction

## Funding ID

### *Austrian Science Fund (FWF) Grants*

10/2016-9/2020	DFG FOR1807 "Advanced Computational Methods for Strongly Correlated Quantum Systems", PI of Project P8 <i>Exact Diagonalization at the Petaflop scale</i> , 120kEuro, 1 PhD position.
1/2016-12/2019	Doktoratskolleg (Graduate School) 'Atoms, Light & Molecules' at the University of Innsbruck, PI of one project, funding for 1 PhD student and 1 associated PhD student.
1/2016-12/2018	SFB "FOQUS", PI of Project P18 <i>Large-Scale Numerical Simulations of Quantum Matter</i> , 375kEuro, for 1 PostDoc position, 2 PhD positions.
10/2013-9/2016	DFG FOR1807 "Advanced Computational Methods for Strongly Correlated Quantum Systems", PI of Project P8 <i>Exact Diagonalization at the Petaflop scale</i> , 110kEuro, 1 PhD position.
1/2013-12/2015	SFB "FOQUS", PI of Project P18 <i>Large-Scale Numerical Simulations of Quantum Matter</i> , 350kEuro, for 1 PostDoc position, 2 PhD positions.

### *Swiss National Science Foundation (SNF) Grants*

I have substantially contributed to the grant application process for the following three Swiss National Science Foundation grants, which funded my direct collaborators of the activity "Numerical Investigation of Strongly Correlated Systems" at IRRMA - EPFL.

4/2004-3/2006	1 PostDoc position, 2 PhD positions
4/2006-3/2009	1 PostDoc position, 2 PhD positions
4/2009-3/2011	2 PhD positions

# Teaching Experience

## Lectures

WS18/19 SS18	<i>Theorie der kondensierten Materie</i> (3h); <i>Nonequilibrium Quantum Many Body Systems</i> (2h)
WS17/18 SS17	<i>Theoretische Physik 4: Statistische Physik</i> (4h); <i>Introduction to Quantum Field Theory</i> (2h)
WS16/17 SS16	<i>Theorie der kondensierten Materie</i> (3h); <i>Holography and AdS/CFT correspondence</i> (2h)
WS15/16 SS15	<i>Theoretische Physik 4: Statistische Physik</i> (4h); <i>Introduction to Quantum Field Theory</i> (2h)
WS14/15 SS14	<i>Theorie der kondensierten Materie</i> (3h); <i>Computational Physics</i> (4h, 50%, with Dr. T.C. Lang)
WS13/14 SS13	<i>Introduction to Quantum Field Theory</i> (4h)
WS12/13 SS12	<i>Theorie der kondensierten Materie</i> (3h); <i>Computational Physics</i> (4h, 50%, with Dr. T.C. Lang)
WS11/12 10/2006 - 6/2008	<i>Modern Topics in Quantum Many Body Physics</i> (4h)
	<i>Theorie der kondensierten Materie</i> (3h)
	<i>Theoretische Physik 4: Statistische Physik</i> (4h)
	<i>Theorie der kondensierten Materie</i> (3h); <i>Computational Physics</i> (4h, 50%, with Dr L. Bonnes)
	<i>Theoretische Physik 4: Statistische Physik</i> (4h)
	<i>Theorie der kondensierten Materie</i> (3h), <i>Simulationismethoden für Quantenvielteilchensysteme</i> (2h)
	<i>Theoretische Physik 4: Statistische Physik</i> (4h)
	<i>Theorie der kondensierten Materie</i> (3h)
	<i>Physique Numérique I/II (Computational physics I/II)</i> , together with Prof. L. Villard, CRPP-EPFL. This lecture was mandatory for all second year bachelor students in physics at EPFL.

## Supervision of post-docs, PhD- and undergraduate students

2018-ongoing	Dr. L. Toikka, PostDoc at University of Innsbruck, ESQ Fellow
2015-ongoing	Dr. T. C. Lang, PostDoc at University of Innsbruck
2018	A. Wietek, PostDoc at University of Innsbruck, now a postdoctoral fellow at CCQ, Flatiron Institute, Simons Foundation, NY.
2014-2017	Dr. L.-P. Henry, PostDoc at University of Innsbruck, now PostDoc at University of Hamburg
2013-2015	Dr. A. Sterdyniak, PostDoc at University of Innsbruck, now PostDoc at MPQ Garching
2012-2013	Dr. H. Changlani, visiting PostDoc at University of Innsbruck, now assistant professor at Florida State University.
2011-2015	Dr. L. Bonnes, PostDoc at University of Innsbruck
2010-2011	Dr. B. Hetenyi, visiting researcher at MPI-PKS, now tenure-track assistant professor at Bilkent University Ankara
2010-2012	Dr. V. Alba, PostDoc at MPI-PKS, now postdoctoral researcher at UvA Amsterdam
2009-2011	Dr. I. Rousochatzakis, PostDoc at MPI PKS, now lecturer at Loughborough University
2009-2011	Dr. D. Charrier, PostDoc at MPI PKS
2009	Dr. S. Wenzel, visiting PostDoc at MPI PKS, now staff scientist at CERN
2008-2011	Dr. E.J. Bergholtz, PostDoc and PKS-Fellow at MPI PKS, now Wallenberg group leader at Stockholm university
2006-2009	Dr. A. Lüscher, PostDoc at IRRMA
2005-2007	Dr. K.P. Schmidt, EPFL, joint post-doc with Prof. F. Mila, now Professor at FAU Erlangen-Nürnberg
2019-ongoing	A. Eberharter, PhD student at University of Innsbruck
2018-ongoing	L.H. Mula, PhD student at University of Innsbruck
2017-ongoing	A. Rakcheev, PhD student at University of Innsbruck
2017-ongoing	C. Ganahl, PhD student at University of Innsbruck
2015-ongoing	M. Rader, PhD student at University of Innsbruck
2014-2019	M. Schuler, PhD student at University of Innsbruck, now a PostDoc in the Rabl group at TU Vienna
2014-2018	C. Romen, PhD student at University of Innsbruck
2013-2017	A. Wietek, PhD student at University of Innsbruck, stayed on as a PostDoc in my group
2012-2013	C.-M. Chung, visiting PhD student at University of Innsbruck, now PostDoc at LMU Munich
2012-2017	C. Krimphoff, PhD student at University of Innsbruck
2010	D. Schwandt, PKS, visiting PhD student from UPS Toulouse
2006-2010	J. Sudan, IRRMA, PhD student at IRRMA, EPF Lausanne
2007-2008	P. Bouillot, IRRMA, PhD student of Prof. T. Giamarchi
2004-2007	C. Weber, IRRMA, PhD student of Prof. T. Giamarchi and Prof. F. Mila, now lecturer at King's College, London
2019-ongoing	M. Patreider, MSc student at University of Innsbruck

## Teaching Experience (continued)

2019-ongoing	M. Trojer, MSc student at University of Innsbruck
2018-ongoing	D. Breoni, MSc student at University of Innsbruck
2018-ongoing	E. Brunori, MSc student at University of Innsbruck
2018-ongoing	S. Graf, MSc student at University of Innsbruck
2017-2019	M. Schwingshackl, MSc student at University of Innsbruck
2017-2019	A. Eberharter, MSc student at University of Innsbruck, now PhD student in my group
2017-2018	J. Rigo, MSc student at University of Innsbruck, now PhD student in the Mitchell group at UC Dublin, Ireland
2017-2018	S. Huber, MSc student at University of Innsbruck
2016-2018	L.H. Mula, MSc student at University of Innsbruck, now PhD student in my group
2014-2017	C. Pernul, MSc student at University of Innsbruck
2014-2015	M. Rader, MSc student at University of Innsbruck, now PhD student in my group
2014-2015	V. Völkl, MSc student at University of Innsbruck, now PhD student at CERN
2013-2015	A. Parteli, MSc student at University of Innsbruck
2012-2013	M. Schuler, MSc student at University of Innsbruck, stayed on as PhD student in my group
2012-2013	C. Romen, MSc student at University of Innsbruck, stayed on as PhD student in my group
2011	I. Dhand, visiting undergraduate student from IIT Kanpur, PhD student at University of Calgary, now PostDoc at Ulm University
2010	B. Chakrabarti, visiting undergraduate student from IIT Kanpur, now PhD student at Rutgers University
2009	K. Agarwal, visiting undergraduate student from IIT Kanpur, PhD student at Harvard University, now assistant professor at McGill University, Canada
2007-2008	J.R. Moret, EPFL, Semester project
2005-2006	P.E. Melchy, EPFL, Semester project
2005	C. Laurent, EPFL, Semester thesis

## Service

### *Referee*

Journals	Science; Nature Physics; Nature Communications; Physical Review Letters; Physical Review A, B, X; New Journal of Physics; Europhysics Letters; European Physical Journal B; Physics Letters A; Journal of Physics A: Mathematical and Theoretical; Journal of Physics - Condensed Matter; Journal of Statistical Mechanics: Theory and Experiment (JSTAT)
Funding Agencies	European Research Council (ERC) Swiss National Science Foundation (SNF) Deutsche Forschungsgemeinschaft (DFG) Agence Nationale de Recherche (ANR) ETH Zürich Swiss Scientific Computing Centre (CSCS)

### *Committees*

2017 - 2020	Elected deputy member of the "QV Beirat" of the Faculty for Mathematics, Computer Science and Physics at the University of Innsbruck. This committee is comparable to tenure committees at other academic institutions.
2017 - 2020	Member of the "Kuratorium" of the Austrian Science Fund (FWF). My role is deputy reporter for the field of Theoretical Physics and Astrophysics.
2013 - 2017	Elected member of the "Fakultätsrat" (school council) of the Faculty for Mathematics, Computer Science and Physics at the University of Innsbruck.
2012 - 2015	Member of the College 4 ("magnetic excitations") subcommittee at the ILL Grenoble. This committee allocates neutron beamtime at various ILL instruments.
2012 - ongoing	Member of the scientific board of the research focus "Scientific Computing" at the University of Innsbruck.
2012 - ongoing	Member of Professor Hiring Committees: "§99(1): Theoretical Quantum Physics (Tenure-Track Model)" (2012), "§98: Theoretical Bio-Nano-Physics" (2012), "§98: Experimental Bio-Nano-Physics" (2012), "§98: Experimental Physics: Ultracold Quantum gases" (2014), "§98: Applied Algebra" (2015), "§98: Theoretical Quantum Physics" (chair, 2017-2018)
2012 - ongoing	Member of Habilitation Committees: B. Kraus (chair, 2012), S. Diehl (chair, 2014), S. Denifl (2011), R. Kissmann (2014), A. Mauracher (2017).

## Service (continued)

- 2009-2011 Member of the MPI PKS visitors program committee. This committee was in charge of selecting applicants for visiting scientist positions.
- 2004 - 2008 Member of the committee "HPC-Tech" at EPF Lausanne. This committee consists of technical experts in high performance computing at the EPFL. Its main mission was to consult the HPC steering committee during the procurement process of new HPC machines at the EPFL.

### *Organization of scientific events*

- 11/2012 Co-organiser (with B.A. Bernevig and M. Haque) of the International Workshop *Entanglement Spectra in Complex Quantum Wavefunctions*, funded and hosted by the MPI PKS, Dresden, 12.11.2012 - 16.11.2012.
- 9/2010 Co-organiser (with M. Troyer and U. Schollwöck) of a CECAM sponsored tutorial on the ALPS libraries and applications, held at ETH Zürich in September 2010.
- 2/2007 I organized a dedicated topical session on "Computational Physics" for the 2007 edition of the annual Swiss Physical Society Meeting in Zürich (in collaboration with F. Mila). We offered a plenary lecture by Prof. M. Parrinello as well as 5 invited talks by distinguished speakers in the field of computational condensed matter and high-energy physics.
- 7/2006 I organized the 7th ALPS developers workshop at EPFL. ALPS is the acronym of an open-source software project targeted at strongly correlated quantum lattice models.
- 5/2006 In may 2006 I organized the "Réunion Fermions Fortements Correlés" meeting at EPF Lausanne. This is regular meeting (twice a year) where theoretical and experimental researchers working in the Suisse Romande present their latest achievements.

## Presentations

### *Invited Conference and Workshop Talks*

- [73] *Large scale numerical simulations of quantum matter*, SFB-FoQuS International Conference, Innsbruck, 05.02.2019.
- [72] *Computational Spectroscopy of Quantum Field Theories*, Topological phases in condensed matter and cold atom systems, Cargèse, 06.10.2018.
- [71] *Finite Correlation Length Scaling in Lorentz-Invariant Gapless iPEPS Wave Functions*, Quantum Magnetism: Frustration, Low-dimensionality, Topology, Beijing, 11.09.2018.
- [70] *Computational Spectroscopy of Quantum Field Theories*, Topological phases of matter: from the quantum Hall effect to spin liquids, Saclay, 26.06.2018.
- [69] *Observation of Finite Entanglement Scaling in Gapless iPEPS Wavefunctions*, Optimising, Renormalising, Evolving, and Quantising Tensor Networks, MPI-PKS Dresden, 20.06.2018.
- [68] *Computational quantum field theory approaches to quantum magnetism*, 673. WE-Heraeus-Seminar on Trends in Quantum Magnetism, Bad Honnef, 04.06.2018.
- [67] *Quantum Criticality in iMPS & iPEPS Tensor Network Methods*, Quantum Paths in Low Dimensions: Theory and Experiment, Wien, 10.04.2018.
- [66] *Observing the space- and time-dependent growth of correlations in dynamically tuned synthetic Ising antiferromagnets*, International Conference on Quantum Optics 2018, Obergurgl, 01.03.2018.
- [65] *Observing the space- and time-dependent growth of correlations in dynamically tuned synthetic Ising antiferromagnets*, Workshop on Numerical Methods for Quantum Optics 2018, Garching, 26.01.2018.
- [64] *Numerical Hamiltonian truncation approach to the  $\phi^4$  theory in 1 + 1d and beyond*, Workshop on "Hamiltonian methods in strongly coupled Quantum Field Theory", IHES, Bures-sur-Yvette, 09.01.2018.
- [63] *SU(N) Symmetric Quantum Magnetism: Chiral Spin Liquids and Thermodynamics*, NCTS Meeting 2016: Quantum Simulations and Numerical Studies in Many-Body Physics, Hsinchu, 09.12.2016.
- [62] *Spectroscopy of Conventional and Unconventional Quantum critical Points in 2+1D*, KITP Conference: Topological Quantum Matter, Santa Barbara, 19.10.2016.

## Presentations (continued)

- [61] *A tale of several chiral spin liquids,*  
Recent Progress in Low-Dimensional Quantum Magnetism (LDQM2016), Lausanne, 05.09.2016.
- [60] *Light-Cones and Thermalization in isolated Quantum Many Body Systems,*  
Entanglement and Non-Equilibrium Physics of Pure and Disordered Systems, Trieste, 25.07.2016.
- [59] *A tale of several Chiral Spin Liquids,*  
Workshop "SU(N) Quantum Magnetism", YITP, Kyoto, 14.07.2016.
- [58] *Torus Energy Spectra of Quantum Critical Points in 2+1D,*  
Workshop "Quantum Matter", Benasque, 28.06.2016.
- [57] *CFTs and Condensed Matter: An Overview and Open Problems,*  
GGI Workshop: Conformal Field Theories and Renormalization Group Flows in Dimensions  $d>2$ , Florenz, 27.05.2016.
- [56] *Universal Signatures of Quantum Critical Points from Finite-Size Torus Spectra: A Window into the Operator Content of Higher-Dimensional Conformal Field Theories.*  
From Quantum Field Theories to Numerical Methods, Stockholm, 03.05.2016.
- [55] *SU(N) quantum magnetism, a new arena for exciting phenomena.*  
Many-body Physics in Synthetic Quantum Systems, Stellenbosch, 07.04.2016.
- [54] *A tale of several Chiral Spin Liquids,,*  
Workshop "Entanglement in Strongly Correlated Systems", Benasque, 18.02.2016.
- [53] *Matrix Product Density Operators: Positivity Issues and Infinite System Algorithm,*  
Vienna Meeting "Numerical methods for open quantum many-body systems", Wien, 28.01.2016.
- [52] *Frustrated Quantum Magnetism: Maximally Simple Quantum Simulators and Chiral Spin Liquids ,*  
ICTP Workshop on Frustration, Localisation and Disorder, Trieste, Sept. 2015
- [51] *Energy and Entanglement Spectra at Conformal Critical Points,*  
CECAM Workshop on Topological States of Matter, Cargèse, Sept. 2015
- [50] *"Light-cone" dynamics after quantum quenches in spin chains,*  
Workshop: "Beyond integrability. The mathematics and physics of integrability and its breaking in low-dimensional strongly correlated quantum phenomena", Montreal, July 2015
- [49] *Entanglement- and Energy-Spectra of Conformal Critical Points,*  
LDQCM-15 Workshop, Amsterdam, July 2015
- [48] *A numerical perspective on entanglement,*  
Program on "Entanglement in Strongly-Correlated Quantum Matter", Kavli Institute for Theoretical Physics (KITP), Santa Barbara, June 2015
- [47] *Entanglement Spectroscopy of Quantum Matter,*  
Workshop "Entangle This: Space, Time & Matter", Madrid, February 2015
- [46] *Spin Liquids on the Kagome Lattice,*  
The 9th International Conference on Computational Physics (ICCP9), Singapore, January 2015
- [45] *Spin Liquids on the Kagome Lattice,*  
International Workshop: Novel Quantum States in Condensed Matter 2014 (NQS2014), Kyoto, November 2014
- [44] *New states of quantum matter in synthetic magnetic fields,*  
Workshop: Quantum Critical Matter: from Atoms to Bulk, QCM14, Obergurgl, August 2014
- [43] *Entanglement spectroscopy of 1+1D CFT systems,*  
International Workshop on "Topology and Entanglement in Correlated Quantum Systems", Dresden, July 2014
- [42] *A journey from the XX to the XXZ limit of the  $S = 1/2$  kagome antiferromagnet,*  
HFM 2014 (International Conference on Highly Frustrated Magnetism), Cambridge, July 2014
- [41] *Entanglement Spectroscopy of Quantum Matter,*  
Quantum Matter 2014, Benasque, June 2014
- [40] *Simulating quantum many body systems with matrix product states methods,*  
Tandem Workshop "Nonlinear Physics at the Nanoscale: A Cross-Fertilization on Stochastic Methods, Dresden, May 2014
- [39] *New States of Quantum Matter in Static Gauge Fields,*  
International Conference on Quantum Optics 2014, Obergurgl, 25.02.2014
- [38] *Entanglement Spectroscopy of Quantum Matter,*  
Joint ICTP-VAST-APCTP Regional School and Conference on Theoretical Physics in Topological Phases and Quantum Computation, Hanoi, December 2013
- [37] *Entanglement spectra and operator content of (boundary) CFTs,*  
Perspectives on Quantum Many-Body Entanglement (PQMBE2013), Mainz, September 2013
- [36] *Entanglement spectra: A novel spectroscopic tool to investigate quantum many body wave functions,*  
XVII. International Conference on Recent Progress in Many-Body Theories (MBT17), Rostock, September 2013

## Presentations (continued)

- [35] *Computer simulations of strongly correlated quantum matter*,  
Joint Annual Meeting of the Austrian Physical Society and Swiss Physical Society, Linz, September 2013
- [34] *Spreading of correlations in quenches with finite-temperature initial conditions*, International Workshop on Quantum Many Body Systems out of Equilibrium, MPI PKS Dresden, August 2013
- [33] *Entanglement spectroscopy of quantum matter*,  
Statistical Physics of Quantum Matter Taipei, Taipei, July 2013
- [32] *Floating, crystalline and paramagnetic phases in chains of interacting Rydberg atoms*,  
Workshop on Ultracold Rydberg Physics, MPI PKS Dresden, July 2013
- [31] *Entanglement Spectroscopy of Quantum Matter*,  
Topological Phases in Condensed Matter and Cold Atom Systems: towards quantum computations, Cargèse, July 2013
- [30] *Hierarchy of Fractional Chern Insulators and Competing Compressible States*,  
DPG-Frühjahrstagung der Sektion Kondensierte Materie (SKM), Regensburg, March 2013
- [29] *An Exact Diagonalization Perspective on the  $S=1/2$  Kagome Heisenberg Antiferromagnet*,  
KITP Program: Frustrated Magnetism and Quantum Spin Liquids, Santa Barbara, October 2012
- [28] *Entanglement Spectra: From Wavefunction Tomography to Continuous Symmetry Breaking*,  
QISM 2012: Quantum Information meets Statistical Mechanics, Innsbruck, September 2012
- [27] *Spin nematic and multipolar physics*,  
Workshop on Mott Physics Beyond Heisenberg 2012, EPF Lausanne, June 2012
- [26] *Simulating quantum many body systems with dissipation*,  
DMRG Gathering, Wien, May 2012
- [25]  *$SU(N)$  quantum magnetism: A new arena for exotic ground states*,  
504. Wilhelm und Else Heraeus-Seminar, Bad Honnef, April 2012
- [24] *The Quest for New Quantum States of Matter: Computational Approaches to Quantum Many Body Systems*,  
Fourth SFB VICOM Workshop (Vienna Computational Materials Laboratory), Wien, April 2012
- [23]  *$SU(N)$  Quantum Magnetism*,  
International Conference on Quantum Optics 2012, Obergurgl, February 2012
- [22] *Nonmagnetic states in frustrated quantum magnets: From Rokhsar Kivelson models to spin liquids in weak Mott insulators*,  
ICTP Workshop on Synergies between Field Theory and Exact Computational Methods in Strongly Correlated Quantum Matter, Trieste, July 2011
- [21] *Large Scale Exact Diagonalizations: A powerful tool to study new states of quantum matter*,  
Joint Annual Meeting of the Swiss Physical Society and Austrian Physical Society, Lausanne, June 2011
- [20] *Spin liquids in the vicinity of Mott transitions: From effective spin models to phase diagrams*,  
Princeton Center for Theoretical Science Workshop: Search for Topological Phases of Matter, Princeton, April 2011
- [19] *Numerical Simulations of Quenches in Bose Hubbard Models*,  
KITP Program on "Disentangling Quantum Many Body Systems", KITP Santa Barbara, October 2010
- [18] *Effektives Spin-Modell zur Beschreibung der Spinflüssigkeitsphase des Hubbard-Modells auf dem Dreiecksgitter*,  
Workshop "Analytische und numerische Methoden korrelierter Elektronen", Bad Honnef, September 2010
- [17] *Three-sublattice ordering of the  $SU(3)$  square lattice antiferromagnet*,  
Japan-Swiss bilateral workshop "New Trends in Theory of Correlated Materials (NTTCM)", Chiba, Japan, 9/2010.
- [16] *Effective spin model for the spin-liquid phase of the Hubbard model on the triangular lattice*,  
Workshop "Emergent Quantum States in Complex Correlated Matter", MPI PKS Dresden, 8/2010.
- [15] *Disentangling entanglement spectra of fractional quantum hall states*,  
Workshop "Quantum Information Concepts for Condensed Matter Problems", MPI PKS Dresden, 6/2010.
- [14] *Pairing properties of population imbalanced fermions with two and three flavors*,  
"International Conference on Quantum Optics", Obergurgl, Austria, 2/2010.
- [13] *Entanglement Spectra of Fractional Quantum Hall States*,  
Workshop "ICTS Condensed Matter Program 2009", International Centre for Theoretical Sciences, Mahabaleshwar, India, 12/2009.
- [12] *Pairing properties of population imbalanced fermions with two and three flavors*,  
CECAM workshop "Ab-initio Modeling of Cold Gases", ETH Zürich, 11/2009.
- [11] *Krylov Implementation of the Hybridization Expansion Impurity Solver*,  
CECAM-CTS Workshop "Recent Developments in Dynamical Mean Field Theory", ETH Zürich, 9/2009.
- [10] *Dimerization Patterns in Kagome Based Heisenberg Models*,  
Conference "Topological Order: From Quantum Hall Systems to Magnetic Materials", MPI PKS Dresden, 7/2009.

## Presentations (continued)

- [9] *The Density Matrix Renormalization Group for quantum spin systems, and The ALPS project for the simulation of quantum lattice models*, ECT\* Workshop "Linking Nuclei, Molecules, and Condensed Matter: Computational Quantum Many-Body Approaches", Trento, 7/2009.
- [8] *Simulating new states of quantum matter*, Research Keynote at the HP-CAST Workshop, Madrid, 5/2009.
- [7] *Exact Diagonalization: a smart tool to study new states of quantum matter* Workshop "Numerical Approaches to Quantum Many-Body Systems", IPAM, UCLA, Los Angeles, 1/2009.
- [6] *Emergent multipolar spin correlations in a fluctuating spiral – The frustrated ferromagnetic Heisenberg chain in a magnetic field*, Highly Frustrated Magnetism conference (HFM2008), Braunschweig, 9/2008.
- [5] *Exotic ground states in high magnetic fields*, Minicolloquium "Magnétisme Quantique : Théories et Expériences", at the "Journées de la matière condensée 11", Strasbourg, 8/2008.
- [4] *Exotic ground states in high magnetic fields*, Symposium "High magnetic field phenomena in low-dimensional magnets" during the DPG spring meeting in Berlin, 2/2008.
- [3] *Dynamical Spin Correlations of the Quantum Kagome Antiferromagnet*, ESF Workshop "Novel theoretical aspects of frustrated spin systems", CECAM Lyon, 3/2006
- [2] *Quantum Lattice Models and Exact Diagonalization*, ALPS users workshop, CSCS Manno, 9/2004
- [1] *The kagome antiferromagnet: some surprises upon doping a spin liquid*, Symposium on the occasion of the retirement of Prof. T.M. Rice, ETH Zürich, 5/2004

## Lectures at Summer and Winter Schools

- [20] *Bose-Hubbard theory*, Introductory Course on Ultracold Quantum Gases (2017), Innsbruck, July 2017
- [19] *Detecting Continuous Symmetry-Breaking in Exact Diagonalization*, Autumn School on Correlated Electrons: Quantum Materials: Experiments and Theory, Jülich, September 2016.
- [18] *Computational Aspects of Quantum Simulation*, Les Houches Summer School "Current Trends in Atomic Physics", Les Houches, July 2016.
- [17] *Quantum information, quantum matter and quantum field theory*, Introductory Course on quantum information 2016, Innsbruck, July 2016
- [16] *Introduction to Exact Diagonalization*, ICTP School on Computational Physics, Trieste, September 2015
- [15] *Bose-Hubbard theory*, Introductory Course on Ultracold Quantum Gases (2015), Innsbruck, July 2015
- [14] *Quantum Information, Quantum Matter and Quantum Field Theory*, Les Houches Doctoral Training in Statistical Physics, Les Houches, June 2015
- [13] *Quantum information, quantum matter and quantum field theory*, Introductory Course on quantum information 2014, Innsbruck, July 2014
- [12] *Exact Diagonalization*, 4th Les Houches School in computational physics: From quantum gases to strongly correlated systems, Les Houches, June 2014
- [11] *Computational Approaches to Quantum Many Body Systems*, Joint ICTP-VAST-APCTP Regional School and Conference on Theoretical Physics in Topological Phases and Quantum Computation, Hanoi, December 2013
- [10] *Exact Diagonalization*, Fall School on Advanced Algorithms for Correlated Quantum Matter, Würzburg, October 2013
- [9] *Exact Diagonalizations and DMRG Methods*, Quantum Spin Liquids: From theory to numerical simulations, SISSA Trieste, September 2013
- [8] *Computational Studies of Quantum Many Body Systems*, 2nd Winterschool of the doctoral school DK+CIM Computational Interdisciplinary Modelling, Obergurgl, March 2013
- [7] *Exact Diagonalization, Quench Dynamics, Entanglement Spectra*, Summer School on Quench Dynamics and Entanglement, Hsinchu, September 2012
- [6] *Algorithms for Quantum Many Body Lattice Models*, 1st Winterschool of the Doctoral School DK+CIM - Computational Interdisciplinary Modelling, Obergurgl, January 2012
- [5] *Exact Diagonalization*, Boulder summer school: "Computational and conceptual approaches to quantum many-body systems", Boulder, USA, July 2010
- [4] *Numerical techniques for strongly correlated systems*, INSTANS (Interdisciplinary Statistical and Field Theory Approaches to Nanophysics and Low Dimensional Systems) summer school 2010, Benasque, June 2010
- [3] *Numerical Techniques for Quantum Systems*, Les Houches School on "Modern Theories of Correlated Electron Systems", Les Houches, May 2009



## Presentations (continued)

- [2] *Exact Diagonalization*, "Numerical Approaches to Quantum Many-Body Systems", IPAM, UCLA, Los Angeles, January 2009
- [1] *"Numerical simulation of frustrated systems"*, ICTP and ESF School on Highly Frustrated Magnets and Strongly Correlated Systems, Trieste, August 2007

### *Invited Colloquia and Seminar Talks*

- [60] *Energy Spectroscopy of Quantum Critical Systems: Theory & Possible Experiments*, Paul Scherrer Institut (PSI), Villigen, 28.03.2019.
- [59] *Computational Spectroscopy of Quantum Field Theories*, Flatiron Institute, Center for Computational Quantum Physics (CCQ), New York, 11.03.2019.
- [58] *Finite Correlation Length Scaling in Lorentz-Invariant Gapless iPEPS Wave Functions*, Technische Universität München (TU München), München, 30.05.2018.
- [57] *Computational Spectroscopy of Quantum Field Theories*, Rheinisch-Westfälische Technische Hochschule Aachen (RWTH), Aachen, 18.04.2018.
- [56] *Computational Spectroscopy of Quantum Field Theories*, Universität zu Köln, 16.04.2018.
- [55] *Computational Spectroscopy of Quantum Field Theories*, Colloquium, Perimeter Institute for Theoretical Physics, Waterloo, 14.03.2018.
- [54] *SU(N) Quantum Magnetism in 1D and 2D*, Abus Salam International Centre for Theoretical Physics (ICTP), Trieste, 23.01.2018.
- [53] *Quantum Magnetism with SU(N) Symmetry: A new arena for exotic phenomena*, Stanford University, 24.10.2016
- [52] *SU(N) quantum magnetism, a new arena for exciting phenomena*, Ludwig-Maximilians-Universität München (LMU), München, 14.06.2016
- [51] *Entanglement Spectroscopy of Quantum Matter*, Université de Cergy-Pontoise, Cergy-Pontoise, 26.11.2015
- [50] *Entanglement Spectroscopy of Quantum Matter*, Perimeter Institute for Theoretical Physics, Waterloo, 03.02.2015
- [49] *Spin Liquids on the Kagome Lattice*, Okinawa Institute of Science and Technology (OIST), Okinawa, 31.10.2014
- [48] *Entanglement spectroscopy of quantum matter*, Boston University, Boston, 15.09.2014
- [47] *Entanglement spectra: A novel spectroscopic tool to investigate quantum many body wave functions*, University of Oxford, Oxford, 31.01.2014
- [46] *Entanglement spectra: A novel spectroscopic tool to investigate quantum many body wave functions*, Theoretisch-Physikalisches Kolloquium - Universität zu Köln, Köln, 17.01.2014
- [45] *Entanglement spectra: A novel spectroscopic tool to investigate quantum many body wave functions*, Georg-August-Universität Göttingen, Göttingen, 26.11.2013
- [44] *Non-equilibrium dynamics of cold atoms in optical lattices: from few to many*, Max Planck Institute for Quantum Optics, Garching, 05.11.2013
- [43] *Entanglement Spectroscopy of Quantum Matter*, Max-Planck-Institut für Physik komplexer Systeme, Dresden, 24.05.2013
- [42] *Entanglement Spectra and Operator content of (Boundary) CFTs*, Ludwig-Maximilians-Universität München (LMU), München, 15.05.2013
- [41] *Entanglement spectra: A novel spectroscopic tool to investigate quantum many body wave functions*, Universitat Autònoma de Barcelona, Barcelona, 30.04.2013
- [40] *Entanglement spectra: A novel spectroscopic tool to investigate quantum many body wave functions*, University of Cambridge, Cambridge, 21.02.2013
- [39] *Entanglement spectra: A novel spectroscopic tool to investigate quantum many body wave functions*, SISSA - International School for Advanced Studies, Trieste, 05.02.2013
- [38] *SU(N) Quantum Magnetism: A new arena for exotic ground states*, Max-Planck-Institut für Quantenoptik (MPQ), Garching, 19.06.2012
- [37] *SU(N) Quantum Magnetism: A new arena for exotic ground states*, Karlsruhe Institute of Technology (KIT), Karlsruhe, 04.06.2012
- [36] *Novel ordered phases and spin liquids in the vicinity of Mott transitions*, Technische Universität Wien (TU Wien), Wien, 18.01.2012
- [35] *Entanglement Spectra of Fractional Quantum Hall States*, Condensed Matter Seminar, Universität Regensburg, 12/2010.
- [34] *Novel ordered phases and spin liquids in the vicinity of Mott transitions*, Theorie Kolloquium, TU Dresden, 11/2010.

## Presentations (continued)

- [33] *The Quest for New Quantum States of Matter: Computational Approaches to Quantum Many Body Systems*, Universität Würzburg, 7/2010.
- [32] *Entanglement Spectra of Fractional Quantum Hall States*, Condensed matter seminar, LMU München, 5/2010.
- [31] *The Quest for New Quantum States of Matter: Computational Approaches to Quantum Many Body Systems*, Freie Universität Berlin, 4/2010.
- [30] *Exotic ground states of quantum spin systems in high magnetic fields*, Paul Scherrer Institut, Villigen, Schweiz, 3/2010
- [29] *Entanglement Spectra of Fractional Quantum Hall States*, Microsoft Station Q, UC Santa Barbara, 2/2010.
- [28] *Die Suche nach neuen Quantenzuständen der Materie: Rechnerbasierte Reise ins Quantenland*, Universität Saarbrücken, 11/2009.
- [27] *The Quest for New Quantum States of Matter: Computational Approaches to Quantum Many Body Systems*, Universität Innsbruck, 11/2009.
- [26] *Exotic ground states of quantum spin systems in high magnetic field*, Physics Colloquium, University of Bristol, 11/2009.
- [25] *Nature of spin excitations in fluctuating quantum magnets*, Festkörperseminar, Forschungszentrum Karlsruhe, 6/2009.
- [24] *The kagome lattice wrapped on a sphere*, Doktorprüfungssymposium, Universität Osnabrück, 6/2009.
- [23] *Nature of spin excitations in fluctuating quantum magnets*, Theorie Kolloquium, Universität Köln, 6/2009.
- [22] *Spin Nematic Phases in Frustrated Quantum Magnets*, Microsoft Station Q, UC Santa Barbara, 2/2009
- [21] *The kagomé antiferromagnet on a sphere*, Kolloquium der Forschergruppe "Nanomagnete", Universität Bielefeld, 11/2008
- [20] *Spin Nematic Phases in Frustrated Quantum Magnets*, Universität Dortmund, 11/2008
- [19] *"On orbital currents in extended Hubbard models of high- $T_c$  cuprates"*, Theoretische Physik, ETH Zürich, 5/2008
- [18] *Spin Nematic Phases in Frustrated Quantum Magnets*, MPI für Physik komplexer Systeme, Dresden, 2/2008
- [17] *Spin Nematic Phases in Frustrated Quantum Magnets*, Universität Marburg, 11/2007
- [16] *Spin Nematic Phases in Frustrated Quantum Magnets*, Universität Göttingen, 5/2007
- [15] *Spin Nematic Phases in Frustrated Quantum Magnets*, School of Physics, University of New South Wales, Sydney, 5/2006
- [14] *Unconventional charge dynamics in doped frustrated magnets*, School of Physics, University of New South Wales, Sydney, 5/2006
- [13] *Spin Nematic Phases in Frustrated Quantum Magnets*, Condensed Matter Theory, Paul Scherrer Institute (PSI), Villigen, 3/2006
- [12] *Spin Nematic Phases in Frustrated Quantum Magnets*, Institut für Theoretische Physik, Universität Hannover, 2/2006
- [11] *Unconventional charge dynamics in doped frustrated magnets*, Colloquium, Department of Physics, University of Waterloo, Canada, 1/2006
- [10] *Unconventional charge dynamics in doped frustrated magnets*, Kolloquium des SFB 608, Universität zu Köln, 6/2005
- [9] *Unconventional charge dynamics in frustrated magnets"*, Institut für Theorie der Kondensierten Materie, Universität Karlsruhe, 5/2005
- [8] *Surprises upon doping a spin liquid: the doped kagome antiferromagnet*, Service de physique théorique, CEA Saclay, 2/2005
- [7] *Unconventional and long-sought phases in cyclic multi spin exchange models on ladders and square lattices*, Département de physique, ENS-Lyon, 6/2004
- [6] *Unconventional phases in low dimensional quantum magnets*, Laboratoire de physique théorique des liquides, Université Paris VI, 1/2004
- [5] *Cyclic exchange interactions in low dimensional quantum magnets*, Theoretische Physik, ETH Zürich, 4/2003
- [4] *Phase Diagram of the Spin Ladder with Four Spin exchange*, Institut de physique théorique, Université Lausanne, 7/2002

## Presentations (continued)

- [3] *Effects of cyclic spin exchange on low dimensional quantum magnets,*  
Laboratoire de physique quantique, Université de Toulouse, 1/2002
- [2] *Li and Zn in Antiferromagnets, Superconductors and Ladders,*  
Physics departement, USC Los Angeles, 3/2001
- [1] *Li and Zn in Antiferromagnets, Superconductors and Ladders,*  
Theory division, Los Alamos National Laboratory, 3/2001