

# Curriculum Vitae

Name: Philippe Roger Corboz  
Nationality: Swiss  
Place of origin: Oron (VD) and Maracon (VD), Switzerland  
Date of birth: February 5, 1978  
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Languages: German, English, French (all fluent), Dutch (B2)



## Professional career

- 05/18 – now Associate Professor (tenured) in Computational Condensed Matter Physics, Institute for Theoretical Physics, University of Amsterdam
- 05/14 – 04/18 Assistant Professor in Computational Condensed Matter Physics, Institute for Theoretical Physics, University of Amsterdam
- 10/11 – 04/14 Lecturer and Swiss National Science Foundation (SNSF) Ambizione Research Fellow, Institute for Theoretical Physics, ETH Zurich
- 10/10 – 09/11 MaNEP mobile Post-Doc, Institute for Theoretical Physics at EPFL and ETH Zurich
- 10/08 – 09/10 Post-Doctoral Research Fellow in the group of Prof. G. Vidal, University of Queensland, Brisbane, Australia
- 01/05 – 09/08 Research Assistant in the group of Prof. M. Troyer, Institute for Theoretical Physics, ETH Zurich
- 05/01 – 07/01 Internship in Informatics at the ABB Research Center, Dättwil, Switzerland. Development of .NET web-applications with access to databases
- 09/00 – 12/00 Internship in Theoretical Physics at the ABB Research Center, Dättwil, Switzerland. Calculation of AC-losses in circular superconductors

## Education and career development

- 01/17 – 05/18 Programme “Personal Leadership in an academic context” at the UvA
- 09/15 – 06/16 Didactic program “Basiskwalificatie Onderwijs (BKO)” at the UvA
- 01/05 – 09/08 Ph.D. at the Institute for Theoretical Physics, ETH Zurich, with Prof. M. Troyer
- 11/04 Graduation in Theoretical Physics *with distinction* at ETH (Master degree)
- 04/04 – 08/04 Diploma Thesis at the Condensed Matter Theory Institute (J. Lidmar), KTH, Stockholm
- 10/01 – 08/04 Studies in Theoretical Physics at ETH Zurich
- 10/98 – 08/00 Undergraduate studies in Physics at EPFL, Switzerland

## Awards and fellowships

- 10/14 Visiting Fellowship at Perimeter Institute for Theoretical Physics, Waterloo, Canada
- 08/11 Swiss National Science Foundation Ambizione Fellowship (research grant for three years)
- 11/04 ETH Pólya Prize for highest grades in final exams (Master degree)

## Grants

- 11/19 Delta ITP grant for a 2-year postdoc position for the project “Realizing the Sachdev-Ye-Kitaev model in strained iridates” together with L. Fritz (UU)
- 12/18 IoP funding for a PhD student shared with the experimental group of Dr. R. Gerritsma (UvA) for the project “A two-dimensional trapped ion quantum simulator”
- 07/16 PhD grant from the Delta ITP Diversity program together with L. Fritz (UU) and D. Schuricht (UU)
- 11/15 ERC starting grant, “Accurate simulations of strongly correlated systems with tensor network methods”, EUR 1'500k for 5 years.
- 12/12 FOR1807 DFG Research Unit “Advanced Computational Methods for Strongly Correlated Quantum Systems”.  
Total EUR 1'500k for 3 years for 8 subprojects located in Germany, Switzerland and Austria, funded by the DFG, SNSF and FWF.  
Principal investigator, together with F. Assaad, R. Noack, F. Heidrich-Meisner, M. Hohenadler, A. Honecker, E. Jeckelmann, A. Läuchli, T. Pruschke, U. Schollwöck, M. Troyer, S. Wessel
- 11/12 CHF 14.4k for workshop on “Tensor network algorithms in computational physics and numerical analysis” in May 2013, funded by CECAM
- 04/12 CHF 20k for workshop on “Tensor network algorithms in computational physics and numerical analysis” in May 2013, funded by the Pauli Center for Theoretical Physics
- 08/11 Swiss National Science Foundation (SNSF) Ambizione grant (PZ00P2\_136863)  
CHF 385k for 3 years, principal investigator

## Memberships and collaboration networks

- Member of the European Tensor Network (<http://quantumtensor.pks.mpg.de/>)
- Member of the Tensor Network Initiative at the Perimeter Institute for Theoretical Physics
- Member of the Delta Institute for Theoretical Physics in the Netherlands
- Affiliated member of QuSoft (Dutch research center for quantum software)
- Affiliated member of the Simons Collaboration of the Many-Electron Problem
- Former member of the DFG FOR1807 research unit
- Contributor to the ALPS project ([alps.comp-phys.org](http://alps.comp-phys.org)) during my PhD

## Expertise

- Condensed matter physics & computational physics
- Quantum many-body physics and strongly correlated systems
- Algorithms for the simulation of strongly correlated systems
- Programming in C++, MATLAB, Python, Mathematica, C#, Java, bash
- Parallelization of codes for large computer clusters

## Event organization

### Scientific events

- 07/19 Organizer of the “Amsterdam Summer Workshop on low-D Quantum Condensed Matter 2019”, University of Amsterdam
- 03/19 Co-organizer of the focus topic "Frustrated magnetism" at the 2019 APS March Meeting
- 07/15 Organizer of the “Amsterdam Summer Workshop on low-D Quantum Condensed Matter 2015”, University of Amsterdam
- 05/13 Organizer of the international workshop on “Tensor network algorithms in computational physics and numerical analysis” at ETH
- 09/06 Co-organizer of international workshop “Monte Carlo data formats” at ETH

### Non-scientific events

- 2002 – 2006 Co-organizer in the cultural association “Drehmoment” in Wohlen, Switzerland (concerts, exhibitions, and performing arts events)
- 06/02 Organizer of the Open Air festival “We are the world” in Switzerland (~2000 people)

## Member of PhD defense committees

- 07/20 Alexandre Foley (Université de Sherbrooke)
- 10/19 Juraj Hasik (SISSA, Trieste, Italy)
- 09/19 Olivier Gauthé (Université de Paul Sabatier, Toulouse, France)
- 06/19 Benedikt Schönauer (University of Utrecht)
- 08/17 Juan Camillo Osorio Iregui (ETH Zurich)
- 02/17 Arthur La Rooij (University of Amsterdam)
- 11/16 Laurens Vanderstraeten (University of Ghent)
- 10/16 Rianne van den Berg (University of Amsterdam)
- 10/15 Bram Wouters (University of Amsterdam)
- 09/13 Wenjun Hu (SISSA, Trieste, Italy)

## Other activities

- 09/16 – now Jury member of the *Pieter Zeeman price* for the best Master thesis in Physics
- 09/14 – 02/20 Organizer of the weekly Condensed Matter Theory seminar at the UvA (>150 seminars)
- 03/08 – now Reviewer for
- Nature
  - Physical Review Letters, Physical Review B, Physical Review Research, Physical Review X
  - Europhysics Letters, European Physical Journal B
  - New Journal of Physics & Journal of Statistical Physics
  - Journal of Physics: Condensed Matter, NPJ Quantum Materials
  - SciPost
- 02/14 – now Project proposal reviewer for
- Research Foundation Flanders (FWO)
  - Deutsche Forschungsgemeinschaft (DFG)
  - European Research Council (ERC)

## Teaching

- 06/20 Master course on “Advanced Computational Condensed Matter” at the UvA
- 04/20 – 05/20 Master course on “Advanced numerical methods in many-body physics” at the UvA
- 02/20 Invited lectures on “Introduction to iPEPS”, Benasque, Spain
- 06/19 Master course on “Advanced Computational Condensed Matter” at the UvA
- 04/19 – 05/19 Master course on “Advanced numerical methods in many-body physics” at the UvA
- 11/18 Invited lectures on “Introduction to iPEPS and MERA”, at the International school “Tensor product state simulations of strongly correlated systems”, MPIPKS, Dresden, Germany
- 06/18 Master course on “Advanced Computational Condensed Matter” at the UvA
- 04/18 – 05/18 Master course on “Advanced numerical methods in many-body physics” at the UvA
- 03/18 Lectures on “Introduction to tensor networks for quantum many-body systems” (3 days) at the DRSTP PhD school, Dalfsen, Netherlands.
- 09/17 Invited lecture on “Projected entangled-pair states (PEPS)” at the 2017 Arnold Sommerfeld School on “Numerical methods for correlated many-body systems”, Munich.
- 04/17 – 05/17 Delta ITP Advanced topics in Theoretical Physics course on “Tensor Networks”, Leiden.
- 02/17 – 04/17 Master course on “Advanced numerical methods in many-body physics” at the UvA
- 11/16 Invited lectures on “Projected entangled-pair states” at the International school “Tensor product state simulations of strongly correlated systems”, MPIPKS, Dresden, Germany
- 07/16 Invited lectures on “Infinite projected entangled-pair states” at ISSP, Japan
- 06/16 Invited lectures on “MERA”, “PEPS”, and “Advanced Tensor Network Applications” at the Simons Center, Stony Brook, USA
- 02/16 – 04/16 Master course on “Advanced numerical methods in many-body physics” at the UvA
- 06/15 Invited lectures on “PEPS Algorithms and Implementations” at the international “Tensor Network Summer School” in Ghent, Belgium
- 02/15 – 04/15 Master course on “Advanced numerical methods in many-body physics” at the UvA
- 09/13 Invited lectures “Introduction to tensor network algorithms” given at the fall school on “Advanced algorithms for correlated quantum matter”, Würzburg, Germany
- 06/12 Invited lectures on “PEPS” and “Fermionic tensor networks” held at the international summer school on “new trends in computational approaches for many-body systems”, Sherbrooke, Canada
- 02/11 – 12/13 Organization, supervision, and chairing of the “CSE (Computational Science and Engineering) seminar in Theoretical Physics”
- 02/11 – 07/11 Teaching assistant in “Numerical Physics” at EPFL
- 01/05 – 12/07 Teaching assistant in “Computational Physics”, “Programming Techniques” (C++), and “Quantum Mechanics” classes
- 08/02 – 02/07 High-school teacher (substitute) in physics and mathematics at the Kantonsschule Wohlen (AG), Switzerland (approx. 200 lessons in total)
- 10/01 – 07/02 Teaching assistant in “Numerics” and “Linear Algebra” at the Math Department, ETH

# Supervision

## Postdocs

05/20 – now Matthias Peschke  
01/19 – now Natalia Chepiga  
09/16 – 08/19 Sangwoo Chung  
10/16 – 03/17 Piotr Czarnik (long term visiting postdoc)

## PhD students

09/19 – now Juan Diego Arias Espinoza (together with R. Gerritsma)  
10/18 – now Patrick Vlaar  
09/17 – now Boris Ponsioen  
10/16 – now Schelto Crone  
07/14 – 07/18 Ido A. Niesen, "Exotic Phases of Matter in Quantum Magnets - A Tensor Networks Tale"  
06/12 – 08/17 Juan C. Osorio Iregui, "Connecting the Dots tensor network algorithms for two-dimensional strongly-correlated systems", ETH Zurich

## Master projects

09/19 – 08/20 K. W. Torre, "Thermodynamics of the Shastry-Sutherland model using MPS"  
09/19 – 08/20 S. Kleijweg, "Optimizing tensor network states using differentiable programming"  
09/18 – 08/20 R. Timmermanns, "Tree tensor networks and visualization of quantum fluctuations"  
09/18 – 08/19 M. Tepaske, "Neuronal Network Quantum States"  
09/17 – 08/18 R. v. d. Werff, "Simulating classical spin systems using the Fixed Point Corner Method"  
09/17 – 07/18 P. Vlaar, "3D tensor network simulations using simple update optimization"  
09/16 – 02/18 K. Temmink, "On tensor network methods for one-dimensional open quantum systems"  
07/16 – 08/17 B. Ponsioen, "Combining Variational Optimization with Entanglement Renormalization in a Tensor Network framework"  
07/16 – 08/17 G. Kapteijns, "Finite bond dimension scaling with the corner transfer matrix renormalization group method"  
09/15 – 08/16 L. Schoonderwoerd, "DMRG with local unitary transformations"  
09/15 – 08/16 S. Crone, "Tensor network renormalization"  
10/14 – 10/15 E. van Walsem, "Quantum Monte Carlo simulations of bosons in 2D lattices", *joint project with the experimental group of dr. R. Spreeuw (UvA)*  
03/12 – 08/12 M. Obrecht, "Simulation of one dimensional quantum systems at finite temperature with minimally entangled typical thermal states" (ETH)  
10/07 – 02/08 P. Sémon, "Pre-projected Gaussian Quantum Monte Carlo for Hubbard ladders" (ETH)

## Bachelor projects

04/18 – 07/18 F. van der Ploeg, "Simulation of the 2D Ising model using the Corner Transfer Matrix Renormalization Group method on the square, honeycomb, and triangular lattice"  
06/17 – 07/17 F. van der Ploeg, D. van den Bergh, "Simulation of the site-percolation problem on a two-dimensional square lattice" (2<sup>nd</sup> year project)  
04/16 – 07/16 R. van der Werff, "Simulating classical spin systems using the CTMRG method"  
04/16 – 07/16 T. Zwart, "Monte Carlo Simulations of the 3-State Potts Model in 2D"

## Publications and Presentations summary

Total publications (52 peer-reviewed papers, 1 book chap., 2 theses, 1 proceeding, 1 preprint)	57
First-author publications	23
Total paper citations <sup>1</sup>	3792
h-index <sup>1</sup>	30
Invited conference talks (44), invited seminars (38), and invited lectures (11)	93
Contributed conference presentations (talks + posters)	24

## Publication list

### Peer-reviewed articles

- [52] *Excitations with Projected Entangled Pair States using the Corner Transfer Matrix method*,  
B. Ponsioen and P. Corboz,  
Phys. Rev. B 101, 195109 (2020).
- [51] *Detecting a  $Z_2$  topologically ordered phase from unbiased infinite projected entangled-pair state simulations*,  
S. P. G. Crone and P. Corboz,  
Phys. Rev. B 101, 115143 (2020).
- [50] *Period 4 stripe in the extended two-dimensional Hubbard model*,  
B. Ponsioen, S. S. Chung, and P. Corboz,  
Phys. Rev. B 100, 195141 (2019).
- [49] *Competition between intermediate plaquette phases in  $SrCu_2(BO_3)_2$  under pressure*,  
C. Boos, S.P.G. Crone, I.A. Niesen, P. Corboz, K.P. Schmidt, F. Mila  
Phys. Rev. B 100, 140413 (2019).
- [48] *Thermodynamic properties of the Shastry-Sutherland model throughout the dimer-product phase*,  
A. Wietek, P. Corboz, S. Wessel, B. Normand, F. Mila, and A. Honecker,  
Phys. Rev. Research 1, 033038 (2019).
- [47]  *$SU(3)$  Fermions on the Honeycomb Lattice at  $1/3$ -Filling*,  
S. Chung and P. Corboz  
Phys. Rev. B 100, 035134 (2019).
- [46] *Finite correlation length scaling with infinite projected entangled pair states at finite temperature*,  
P. Czarnik and P. Corboz,  
Phys. Rev. B 99, 245107 (2019).

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<sup>1</sup> Google Scholar in October 2020

- [45] *Emergent Bound States and Impurity Pairs in Chemically Doped Shastry-Sutherland System*,  
Z. Shi, W. Steinhardt, D. Graf, P. Corboz, D. Weickert, N. Harrison, M. Jaime, C. Marjerrison, H.  
Dabkowska, F. Mila, and S. Haravifard  
Nature Communications 10, 2439 (2019).
- [44] *Time Evolution of an Infinite Projected Entangled Pair State: an Efficient Algorithm*,  
P. Czarnik, J. Dziarmaga, and P. Corboz,  
Phys. Rev. B. 99, 035115 (2019).
- [43] *Thermodynamic properties of the Shastry-Sutherland model from quantum Monte Carlo simulations*  
S. Wessel, I. Niesen, J. Stapmanns, B. Normand, F. Mila, P. Corboz, and A. Honecker,  
Phys. Rev. B. 98, 174432 (2018).
- [42] *Thermal Critical Points and Quantum Critical End Point in the Frustrated Bilayer Heisenberg  
Antiferromagnet*,  
J. Stapmanns, P. Corboz, F. Mila, A. Honecker, B. Normand, and S. Wessel,  
Phys. Rev. Lett. 121, 127201 (2018).
- [41] *Finite Correlation Length Scaling with Infinite Projected Entangled-Pair States*,  
P. Corboz, P. Czarnik, G. Kapteijns, and L. Tagliacozzo,  
Phys. Rev. X 8, 031031 (2018).
- [40] *Ground-state study of the spin-1 bilinear-biquadratic Heisenberg model on the triangular lattice  
using tensor networks*,  
I. Niesen and P. Corboz,  
Phys. Rev. B 97, 245146 (2018).
- [39] *A tensor network study of the complete ground state phase diagram of the spin-1 bilinear-  
biquadratic Heisenberg model on the square lattice*,  
I. Niesen and P. Corboz,  
SciPost Physics 3, 030 (2017).
- [38] *Stripe order in the underdoped region of the two-dimensional Hubbard model*,  
B.-X. Zheng, C.-M. Chung, P. Corboz, G. Ehlers, M.-P. Qin, R. M. Noack, H. Shi, S. R. White, S.  
Zhang, and G. K.-L. Chan,  
Science 358, 1155 (2017).
- [37] *Infinite Matrix Product States vs Infinite Projected Entangled-Pair States on the Cylinder: a  
comparative study*,  
J. Osorio Iregui, M. Troyer, and P. Corboz,  
Phys. Rev. B 96, 115113 (2017).
- [36] *Emergent Haldane phase in the  $S=1$  bilinear-biquadratic Heisenberg model on the square lattice*,  
I. Niesen and P. Corboz,  
Phys. Rev. B 95, 180404 (2017).

- [35] *Gradient methods for variational optimization of projected entangled-pair states*,  
L. Vanderstraeten, J. Haegeman, P. Corboz, and F. Verstraete,  
Phys. Rev. B 94, 155123 (2016). *Editors' Suggestion*
- [34] *Variational optimization with infinite projected entangled-pair states*,  
P. Corboz,  
Phys. Rev. B 94, 35133 (2016). *Editors' Suggestion*
- [33] *Plaquette order in the SU(6) Heisenberg model on the honeycomb lattice*,  
P. Nataf, M. Lajkó, P. Corboz, A. M. Läuchli, K. Penc, and F. Mila,  
Phys. Rev. B 93, 201113 (2016). *Rapid Communication*
- [32] *Improved energy extrapolation with infinite projected entangled-pair states applied to the 2D Hubbard model*,  
P. Corboz,  
Phys. Rev. B 93, 045116 (2016)
- [31] *Infinite projected entangled pair states algorithm improved: Fast full update and gauge fixing*,  
H. N. Phien, J. A. Bengua, H. D. Tuan, P. Corboz, and R. Orus, Phys.  
Rev. B 92, 035142 (2015)
- [30] *Efficient Continuous-time Quantum Monte Carlo Method for the Ground State of Correlated Fermions*,  
L. Wang, M. Iazzi, P. Corboz, and M. Troyer,  
Phys. Rev. B 91, 235151 (2015). *Editors' Suggestion*
- [29] *Probing the stability of the spin liquid phases in the Kitaev-Heisenberg model using tensor network algorithms*,  
J. O. Iregui, P. Corboz, and M. Troyer,  
Phys. Rev. B 90, 195102 (2014)
- [28] *Fermionic Quantum Critical Point of Spinless Fermions on a Honeycomb Lattice*,  
L. Wang, P. Corboz, and M. Troyer,  
New Journal of Physics 16, 103008 (2014)
- [27] *Competing states in the t-J model: uniform d-wave state versus stripe state*,  
P. Corboz, T. M. Rice, and M. Troyer, Phys.  
Rev. Lett. 113, 046402 (2014).  
*Recommended in the Journal Club for Condensed Matter Physics by S. Kivelson<sup>2</sup>*
- [26] *Resonating-valence-bond superconductors with fermionic projected entangled pair states*,  
D. Poilblanc, P. Corboz, N. Schuch, and J. I. Cirac,  
Phys. Rev. B 89, 241106 (2014). *Rapid Communication*

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<sup>2</sup> see <http://www.condmatjournalclub.org/?p=2367>



- [25] *Crystals of bound states in the magnetization plateaus of the Shastry-Sutherland model*,  
P. Corboz and F. Mila,  
Phys. Rev. Lett. 112, 147203 (2014)
- [24] *Magnetization of  $\text{SrCu}_2(\text{BO}_3)_2$  in Ultrahigh Magnetic Fields up to 118 T*,  
Y. H. Matsuda, N. Abe, S. Takeyama, H. Kageyama, P. Corboz, A. Honecker, S. R. Manmana,  
G. R. Foltin, K. P. Schmidt, and F. Mila,  
Phys. Rev. Lett. 111, 137204 (2013)
- [23] *Competition between three-sublattice order and superfluidity in the quantum 3-state Potts model of ultracold bosons and fermions on a square optical lattice*,  
L. Messio, P. Corboz, and F. Mila,  
Phys. Rev. B 88, 155106 (2013)
- [22] *Competing states in the  $SU(3)$  Heisenberg model on the honeycomb lattice: Plaquette valence-bond crystal versus dimerized color-ordered state*,  
P. Corboz, M. Lajkó, K. Penc, F. Mila, and A. M. Läuchli,  
Phys. Rev. B 87, 195113 (2013)
- [21] *Tensor network study of the Shastry-Sutherland model in zero magnetic field*,  
P. Corboz and F. Mila,  
Phys. Rev. B 87, 115144 (2013)
- [20] *Phase diagram of  $^4\text{He}$  on graphene*,  
J. Happacher, P. Corboz, M. Boninsegni, and L. Pollet,  
Phys. Rev. B 87, 094514 (2013)
- [19] *Spin-Orbital Quantum Liquid on the Honeycomb Lattice*,  
P. Corboz, M. Lajkó, A. M. Läuchli, K. Penc, and F. Mila,  
Phys. Rev. X 2, 041013 (2012)
- [18] *Simplex solids in  $SU(N)$  Heisenberg models on the kagome and checkerboard lattices*,  
P. Corboz, K. Penc, F. Mila, and A. M. Läuchli,  
Phys. Rev. B 86, 041106 (2012). *Rapid Communication*
- [17] *Comment on "Topological quantum phase transitions of attractive spinless fermions in a honeycomb lattice" by D. Poletti et al.*,  
P. Corboz, S. Capponi, A. M. Läuchli, B. Bauer, R. Orus,  
Europhys. Lett. 98, 27005 (2012)
- [16] *Three-sublattice order in the  $SU(3)$  Heisenberg model on the square and triangular lattice*,  
B. Bauer, P. Corboz, A. M. Läuchli, L. Messio, K. Penc, M. Troyer, F. Mila,  
Phys. Rev. B 85, 125116 (2012)
- [15] *Simultaneous dimerization and  $SU(4)$  symmetry breaking of 4-color fermions on the square lattice*,  
P. Corboz, A. M. Läuchli, K. Penc, M. Troyer, F. Mila,  
Phys. Rev. Lett. 107, 215301 (2011)

- [14] *Stripes in the two-dimensional t-J model with infinite projected entangled-pair states*,  
P. Corboz, S. R. White, G. Vidal, and M. Troyer,  
Phys. Rev. B 84, 041108 (2011). *Rapid Communication, Editor's Suggestion*
- [13] *Implementing global Abelian symmetries in projected entangled-pair state algorithms*,  
B. Bauer, P. Corboz, R. Orus, and M. Troyer,  
Phys. Rev. B 83, 125106 (2011)
- [12] *Simulation of fermionic lattice models in two dimensions with projected entangled-pair states: Next-nearest neighbor Hamiltonians*,  
P. Corboz, J. Jordan, and G. Vidal, Phys. Rev. B 82, 245119 (2010).  
This article has been selected for the January 2011 issue of Virtual Journal of Quantum Information, and for the January 3, 2011 issue of Virtual Journal of Nanoscale Science & Technology
- [11] *Non-local scaling operators with entanglement renormalization*,  
G. Evenbly, P. Corboz, and G. Vidal,  
Phys. Rev. B 82, 132411 (2010)
- [10] *Simulation of anyons with tensor network algorithms*,  
R. N. C. Pfeifer, P. Corboz, O. Buerschaper, M. Aguado, M. Troyer, and G. Vidal,  
Phys. Rev. B 82, 115126 (2010).  
This article has been selected for the October 2010 issue of Virtual Journal of Quantum Information, and for the October 4, 2010 issue of Virtual Journal of Nanoscale Science & Technology
- [9] *Simulation of strongly correlated fermions in two spatial dimensions with fermionic projected entangled-pair states*,  
P. Corboz, R. Orús, B. Bauer, and G. Vidal,  
Phys. Rev. B 81, 165104 (2010)
- [8] *Simulation of interacting fermions with entanglement renormalization*,  
P. Corboz, G. Evenbly, F. Verstraete, and G. Vidal,  
Phys. Rev. A 81, 010303 (2010). *Rapid Communication*
- [7] *Fermionic multi-scale entanglement renormalization ansatz*,  
P. Corboz and G. Vidal,  
Phys. Rev. B 80, 165129 (2009).  
This article has been selected for the November 2009 issue of Virtual Journal of Quantum Information, and for the November 9, 2009 issue of Virtual Journal of Nanoscale Science & Technology
- [6] *Binding of a Helium-3 Impurity to a Screw Dislocation in Solid Helium-4*,  
P. Corboz, L. Pollet, N. V. Prokof'ev, and M. Troyer,  
Phys. Rev. Lett. 101, 155302 (2008)
- [5] *Phase diagram of Helium-4 adsorbed on graphite*,  
P. Corboz, M. Boninsegni, L. Pollet, and M. Troyer,  
Phys. Rev. B 78, 245414 (2008)

- [4] *Systematic errors in Gaussian quantum Monte Carlo and a systematic study of the symmetry projection method*,  
P. Corboz, A. Kleine, F. F. Assaad, I. P. McCulloch, U. Schollwoeck, and M. Troyer,  
Phys. Rev. B 77, 085108 (2008)
- [3] *Spontaneous trimerization in a bilinear-biquadratic  $S=1$  zig-zag chain*,  
P. Corboz, A. M. Läuchli, K. Totsuka, and H. Tsunetsugu,  
Phys. Rev. B 76, 220404(R) (2007). *Rapid Communication*
- [2] *The ALPS project release 1.3: open source software for strongly correlated systems*,  
A.F. Albuquerque et al. (ALPS collaboration),  
Journal of Magnetism and Magnetic Materials 310, 1187 (2007)
- [1] *Symmetry projection schemes for Gaussian Monte Carlo methods*,  
F. F. Assaad, P. Werner, P. Corboz, E. Gull, and M. Troyer,  
Phys. Rev. B 72, 22451 (2005)

#### Book chapters

- [B1] *Phase-Space Methods for Fermions*,  
P. Corboz, M. Ögren, K. Kheruntsyan, and J. F. Corney,  
in S. Gardiner, N. Proukakis, and M. Davis, *Quantum Gases: Finite Temperature and Non-Equilibrium Dynamics* (Imperial College Press, 2012)

#### Conference proceedings

- [C1] *Gaussian Quantum Monte Carlo methods with symmetry projection*,  
F. F. Assaad, P. Corboz, E. Gull, W. P. Petersen, M. Troyer, and P. Werner,  
AIP Conf. Proc. 816, 2 4 (2006)

#### Theses

- [T2] *Simulations of strongly correlated bosons and fermions (PhD Thesis)*,  
P. Corboz,  
No 17994, ETH Zurich (2008)
- [T1] *Breakable elastic string driven in random media (Master Thesis)*,  
P. Corboz,  
Trita-FYS, 0280-316X; 2004:53

## Preprints / submitted papers

- [S1] *A quantum magnetic analogue to the critical point of water*,  
J. L. Jiménez, S. P. G. Crone, E. Fogh, M. E. Zayed, R. Lortz, E. Pomjakushina, K. Conder, A. M. Läuchli, L. Weber, S. Wessel, A. Honecker, B. Normand, C. Rüegg, P. Corboz, H. M. Rønnow, and F. Mila, ArXiv:2009.14492 [Cond-Mat] (2020).

## Conference presentations

### Invited conference talks (44)

- 03/20 Conference “Quantum Matter: Computation meet Experiments”, Aspen Center for Physics, USA, “Tensor network studies of the Shastry-Sutherland model”
- 11/19 Plenary speaker at the Symposium on Theoretical Physics, Hamburg, Germany, “Simulations of the 2D Hubbard model with 2D tensor networks”
- 09/19 Workshop at the Université Paul Sabatier, Toulouse, “Simulations of the 2D Hubbard model with iPEPS”
- 07/19 ISTCP Congress 2019, Tromsø, Norway, “Simulation of strongly correlated systems with 2D tensor networks”
- 03/19 Workshop on “Tensor networks: from simulations to holography II”, Potsdam, Germany, “Simulation of the 2D Hubbard model with iPEPS”
- 02/19 Workshop on “Perspectives in Theoretical Physics”, Hamburg, Germany, “Recent advances in simulating strongly correlated systems with 2D tensor networks”
- 10/18 Workshop “TOPO2018: Topological Phases in Condensed Matter and Cold Atom Systems”, Cargèse, France, “Finite correlation length scaling”
- 09/18 Workshop “Quantum Magnetism: Frustration, Low-dimensionality, Topology”, UCAS, Beijing, China, “Study of 2D critical phenomena and the doped Shastry-Sutherland model with infinite projected entangled-pair states (iPEPS)”
- 01/18 Workshop “Hamiltonian methods in strongly coupled Quantum Field Theory”, Paris, France, “Simulation of 2D strongly correlated systems with infinite projected entangled-pair states”
- 12/17 Workshop “Tensor-Network Methods: Structure, Applications & Holography”, Stony Brook, USA, “Advances in simulating 2D strongly correlated systems with iPEPS”
- 11/17 Conference on “Frontiers in Two-Dimensional Quantum Systems”, Trieste, Italy, “Stripe order in the 2D Hubbard model”
- 11/17 Conference on “Novel Quantum States in Condensed Matter 2017”, Kyoto, Japan, “2D tensor network study of the  $S=1$  bilinear-biquadratic Heisenberg model”
- 10/17 FISMAT 2017 conference, Trieste, Italy, “Stripe order in the 2D Hubbard model”
- 09/17 Korrelationstage 2017, Dresden, Germany, “Stripe order in the 2D Hubbard model”
- 06/17 Conference on “Recent Progress in Many Body Theory (RPMBT19)”, Pohang, Korea, “Stripe order in the 2D Hubbard model”

- 10/16 The Munich Quantum Symposium 2016, Munich, Germany,  
"Simulation of strongly correlated systems with 2D tensor network methods"
- 10/16 Workshop "Quantum Many-Body Methods in Condensed Matter Physics", Aachen, Germany,  
"Recent progress in simulating strongly correlated systems with 2D tensor network methods"
- 09/16 International workshop "Recent Progress in Low-Dimensional Quantum Magnetism", EPFL,  
"Crystals of Bound States in the Magnetization Plateaus of the Shastry-Sutherland Model"
- 07/16 Symposium on "Tensor Networks and Quantum Many-Body Problems (TNQMP2016)", ISSP,  
Kashiwa, Japan, "Recent advances in simulating the 2D Hubbard and t-J models with iPEPS"
- 05/16 International workshop "From Quantum Field Theories to Numerical Methods", Nordita,  
Stockholm, "Recent advances with iPEPS: simulations of the 2D Hubbard model, improved  
energy extrapolations, and variational optimization"
- 03/16 APS March meeting 2016, Baltimore, USA,  
"Tensor network studies of the 2D t-J and Hubbard models"
- 02/16 Annual meeting of Collaboration on the Many Electron Problem 2016, Simons Foundation, New  
York, USA,  
"Recent progress in simulating strongly correlated systems with 2D tensor network methods"
- 10/15 PI-UIUC joint workshop, Perimeter Institute, Waterloo, Canada,  
"Tensor network studies of 2D fermionic and frustrated systems"
- 07/15 ICTP conference "Interacting Fermions: Precision Theory and Experiment", Trieste, Italy,  
"Competing states in the t-J and Hubbard models: uniform d-wave state versus stripe state"
- 06/15 International workshop and symposium on "DMRG Technique for Strongly Correlated Systems in  
Physics and Chemistry", Natal, Brazil,  
"Simulation of strongly correlated systems in 2D with iPEPS"
- 01/15 Physics@FOM Veldhoven meeting, Veldhoven, Netherlands,  
"Simulation of 2D strongly correlated systems with tensor network methods"
- 11/14 Quantum Matter Templeton meeting, Leiden University,  
"Projected Entangled-Pair States".
- 10/14 CMSI International Workshop 2014: Tensor Network Algorithms in Materials Science, Kobe,  
Japan,  
"Recent progress in simulating strongly correlated systems with tensor network methods".
- 09/14 International workshop on "Numerical and analytical methods for strongly correlated systems",  
Benasque, Spain,  
"Introduction to tensor networks" and "Recent progress with iPEPS"
- 08/14 XXVI IUPAP Conference on Computational Physics, CCP2014, Boston, Massachusetts, USA,  
"Recent progress in simulating strongly correlated systems with tensor network methods"
- 07/14 Strongly Correlated Electron Systems (SCES 2014), Grenoble, France,  
"Competing states in the t-J model: uniform d-wave state versus stripe state"
- 09/13 XVII. International Conference on Recent Progress in Many-Body Theories (MBT17), Rostock,  
Germany, "Simulation of strongly correlated systems 2D with tensor network algorithms"
- 06/13 International workshop on Topological Phases in Condensed Matter and Cold Atom Systems,  
Institut d'Etudes Scientifiques de Cargèse (IESC), Corsica island,  
"Introduction to tensor networks"

- 05/13 International workshop on Emergence and Entanglement II: Highly entangled phases of matter, Perimeter Institute, Waterloo, Canada,  
"Spin-orbital quantum liquid on the honeycomb lattice"
- 03/13 APS March meeting, Baltimore, USA,  
"Spin-orbital quantum liquid on the honeycomb lattice"
- 10/12 International workshop on Cooperative Quantum Dynamics and Its Control (CQDC2012), Jülich Supercomputing Centre (Germany),  
"Simulation of strongly correlated systems 2D with infinite projected entangled-pair states"
- 06/12 Conference on Mott Physics Beyond Heisenberg 2012, EPF Lausanne,  
"Tensor network simulations of spin-orbital systems"
- 05/12 Networking tensor networks: many-body systems and simulations, Benasque, Spain,  
"Recent progress with infinite projected entangled-pair states"
- 05/12 DMRG Gathering 2012, Vienna,  
"Simulations of SU(N) Heisenberg models with iPEPS: simplex solid states"
- 10/11 Tensor Networks for Quantum Field Theories, Perimeter Institute, Waterloo, Canada,  
"Simulation of Fermionic and Frustrated Systems with 2D Tensor Networks"
- 11/10 KITP Program: Disentangling Quantum Many-body Systems, Santa Barbara, USA,  
"Fermionic tensor networks"
- 06/10 Quantum information concepts in condensed matter physics, MIPPKS Dresden,  
"Simulations of strongly correlated quantum systems with tensor network algorithms"
- 03/10 CECAM workshop on tensor network methods in Quantum Chemistry, ETH Zurich,  
"Simulations of strongly correlated quantum systems with tensor network algorithms"
- 01/10 Thirteenth Workshop on Quantum Information Processing (QIP 2010), ETH Zurich,  
"Simulations of strongly correlated quantum systems with tensor network algorithms"

#### **Contributed talks (14)**

- 01/13 MANeP workshop, Neuchatel,  
"Simulations of spin-orbital models in two dimensions with tensor network algorithms"
- 01/12 MANeP workshop, Neuchatel,  
"Simulation of strongly correlated systems with tensor network algorithms"
- 11/11 CECAM workshop: Modeling Materials With Cold Gases Through Simulations, ETH, "Simulation of strongly correlated systems in two dimensions with tensor network algorithms"
- 10/11 Workshop on Quantum Inf. in Quantum Many-body Physics, CRM, U. de Montréal, Canada,  
"Recent progress in the simulation of strongly correlated systems in two dimensions with tensor network algorithms"
- 09/11 Swiss-Japanese Workshop, ETH Zurich,  
"Recent progress in the simulation of strongly correlated systems in two dimensions with tensor network algorithms"
- 09/11 QIPC conference, ETH Zurich, (contributed "hot-topic" talk),  
"Recent advances in the simulation of strongly correlated systems in two dimensions with tensor network algorithms"

- 06/11 Annual meeting of the Swiss Physical Society (SPS), Lausanne, Switzerland,  
"Simulation of fermionic and frustrated lattice models in 2D with tensor network algorithms"
- 03/11 APS March meeting, Dallas, USA,  
"Simulation of fermionic and frustrated lattice models in 2D with tensor network algorithms"
- 01/11 MANeP Workshop, Neuchatel,  
"Simulation of strongly correlated systems with Projected Entangled-Pair States (PEPS)"
- 07/10 STATPHYS24, Cairns, Australia,  
"Simulation of fermionic lattice models in two dimensions with tensor network algorithms"
- 01/10 Workshop on tensor networks, MPI Garching, Germany,  
"Simulations of strongly correlated quantum systems with tensor network algorithms"
- 05/07 Quantum Noise workshop 2007, Caloundra, Australia,  
"The Gaussian Quantum Monte Carlo method for fermions with symmetry projection"
  
- 03/07 March meeting of the American Physical Society, Denver, Colorado, USA,  
"Bilinear-Biquadratic Spin 1 Zig-Zag Chain"
- 02/07 SPS annual meeting, University of Zurich, Switzerland,  
"Bilinear-Biquadratic Spin 1 Zig-Zag Chain"

**Poster presentations (10)**

- 02/12 QSIT meeting, Arosa, Switzerland,  
"Tensor network algorithms"
- 06/11 Swiss Workshop MaNEP, Les Diablerets, Switzerland,  
"Striped phase in the t-J model with infinite projected entangled-pair states"
- 01/11 QSIT meeting, Arosa, Switzerland,  
"Tensor network states"
- 08/08 ULT2008: Frontiers of Low Temperature Physics, University of London, Egham,  
"Phase diagram of  $^4\text{He}$  adsorbed on graphite"
- 03/08 SPS annual meeting, Geneva, Switzerland,  
"Spontaneous trimerization in a bilinear-biquadratic  $S=1$  zig-zag chain"
- 09/07 Swiss Workshop MaNEP, Les Diablerets, Switzerland,  
"Spontaneous trimerization in a bilinear-biquadratic  $S=1$  zig-zag chain"
- 01/07 Workshop on Highly Frustrated Magnetism, Dresden, Germany,  
"Bilinear-Biquadratic Spin 1 Zig-Zag Chain"
- 12/06 Colloque numerique Suisse, EPFL, Switzerland,  
"The Gaussian Quantum Monte Carlo method for fermions with symmetry projection"
- 11/05 C4 Workshop, ETH Zurich,  
"The Gaussian Quantum Monte Carlo method for fermions with symmetry projection"
- 10/05 Swiss Workshop MaNEP, Les Diablerets, Switzerland,  
"The Gaussian Quantum Monte Carlo method for fermions with symmetry projection"

## Invited seminar talks (38)

- 06/20 European Tensor Network online seminar series,  
"Simulations of the 2D Hubbard model with iPEPS"
- 04/20 HEP-TN online seminar ([www.heptnseminar.org](http://www.heptnseminar.org)),  
"Simulation of strongly correlated systems with infinite projected entangled-pair states (iPEPS)"
- 06/19 University of Cologne, Germany,  
"Stripes in the 2D Hubbard model and finite correlation length scaling with iPEPS"
- 03/19 EPFL Switzerland,  
"Simulation of quantum many-body systems with tensor network algorithms"
- 03/19 MPIPKS Dresden, Germany,  
"Simulation of the 2D Hubbard model and finite correlation length scaling with iPEPS"
- 04/18 University of Leiden, Netherlands,  
"2D tensor network algorithms applied to the 2D Hubbard model"
- 10/17 University of Stuttgart, Germany,  
"Simulation of strongly correlated systems with iPEPS"
- 06/17 Amsterdam Machine Learning Lab, University of Amsterdam,  
"Introduction to tensor networks"
- 12/16 King's College, London, UK,  
"Tensor network studies of 2D fermionic and frustrated systems"
- 11/16 Radboud University, Nijmegen, Netherlands,  
"Simulation of strongly correlated quantum many-body systems"
- 10/16 University of Amsterdam, Netherlands,  
"Simulation of strongly correlated quantum many-body systems"
- 09/16 University of Ghent, Belgium,  
"Recent progress in simulating strongly correlated systems with 2D tensor network methods"
- 04/16 QuSoft, CWI, Amsterdam,  
"Introduction to tensor networks"
- 11/15 Utrecht University, Netherlands,  
"Tensor network studies of 2D fermionic and frustrated systems"
- 10/15 University of Oxford, UK,  
"Simulation of fermionic and frustrated systems with 2D tensor networks"
- 10/14 University of Tokyo, Japan,  
"Recent progress in simulating strongly correlated systems with 2D tensor network methods"
- 06/14 RWTH Aachen, Germany,  
"Tensor network studies of the t-J and the Shastry-Sutherland model"
- 07/13 University of Cologne, Germany,  
"Simulation of strongly correlated systems in two dimensions with tensor network algorithms"
- 04/13 University of Amsterdam, Netherlands,  
"Simulation of strongly correlated systems in two dimensions with tensor network algorithms"
- 03/13 University of Basel, Switzerland,  
"Simulation of strongly correlated systems in two dimensions with tensor network algorithms"



- 03/13 University of Zurich, Switzerland, "Simulation of strongly correlated systems in two dimensions with tensor network algorithms"
- 12/12 ICFO, Castelldefels, Barcelona, Spain,  
"Recent progress in the simulation of strongly correlated systems in two dimensions with tensor network algorithms"
- 11/12 LMU Munich,  
"Tensor network studies of exotic phases in  $SU(N)$  Heisenberg models"
- 03/12 Theory Colloquium at ETH,  
"Simulation of strongly correlated systems in two dimensions with tensor network algorithms"
- 11/10 EPFL, Switzerland,  
"Introduction to tensor network algorithms"
- 04/10 MPIPKS, Dresden, Germany,  
"Simulation of fermionic lattice models in two dimensions with tensor network algorithms"
- 02/10 ETH Zurich, Switzerland,  
"Simulation of fermionic lattice models in two dimensions with tensor network algorithms"
- 02/10 EPFL, Switzerland,  
"Simulation of fermionic lattice models in two dimensions with tensor network algorithms"
- 11/09 University of Queensland, Brisbane, Australia,  
"On the formalism of fermionic tensor networks"
- 10/09 University of Queensland, Brisbane, Australia,  
"Simulation of fermionic lattice models in two dimensions with tensor network algorithms"
- 10/08 University of Queensland, Brisbane, Australia,  
"Phase diagram of Helium-4 films adsorbed on a graphite substrate"
- 07/08 ETH Zurich, Switzerland,  
"Phase diagram of Helium-4 films adsorbed on a graphite substrate"
- 05/07 University of Queensland, Brisbane, Australia,  
"The Gaussian Quantum Monte Carlo method with symmetry projection"
- 05/07 University of Tokyo, Hongo, Tokyo, Japan,  
"The Gaussian Quantum Monte Carlo method with symmetry projection"
- 05/07 ISSP, University of Tokyo, Kashiwa, Japan,  
"The Gaussian Quantum Monte Carlo method with symmetry projection"
- 03/07 Boston University, USA  
"The Gaussian Quantum Monte Carlo method with symmetry projection"
- 03/07 University of Southern California, Los Angeles, CA, USA,  
"The Gaussian Quantum Monte Carlo method with symmetry projection"
- 02/07 University of California, Irvine, CA,  
"The Gaussian Quantum Monte method with symmetry projection"  
"Bilinear-biquadratic Spin 1 Zig-Zag chain"

## Invited lectures at international schools (11)

- 03/02 International school and workshop on “Entanglement in Strongly Correlated Systems”, Benasque, Spain, “Introduction to infinite projected entangled pair states” (3 lectures)
- 11/18 International school “Tensor product state simulations of strongly correlated systems”, MPIPKS, Dresden, Germany, “Projected entangled-pair states” (2 lectures)
- 10/18 Workshop “TOPO2018: Topological Phases in Condensed Matter and Cold Atom Systems”, Cargèse, France, “Introduction to iPEPS”
- 03/18 DRSTP PhD school, Dalfsen, Netherlands, “Introduction to tensor networks for quantum many-body systems”
- 09/17 Arnold Sommerfeld School on “Numerical methods for correlated many-body systems”, Munich, “Projected entangled-pair states (PEPS)”
- 11/16 International school “Tensor product state simulations of strongly correlated systems”, MPIPKS, Dresden, Germany, “Projected entangled-pair states” (2 lectures)
- 07/16 Workshop on “Tensor Networks and Quantum Many-Body Problems (TNQMP2016)”, ISSP, Japan “Introduction to iPEPS” (2 lectures)
- 06/16 International summer school of the “Many Electron Problem Collaboration”, Simons Center, Stony Brook, USA, “MERA”, “PEPS”, and “Advanced Tensor Network Applications” (3 lectures)
- 06/15 International “Tensor Network Summer School” in Ghent, Belgium, “PEPS Algorithms and Implementations” (2 lectures)
- 10/13 Fall school on “Advanced algorithms for correlated quantum matter”, Würzburg, Germany, “Introduction to tensor network algorithms”
- 06/12 International summer school on “new trends in computational approaches for many-body systems”, Sherbrooke, Canada. “PEPS” and “Fermionic tensor networks” (2 lectures)