Curriculum Vitae
updated on 10 Nov 2025

Name: Natalia Chepiga
Nationality: Ukrainian
Place of birth: Kharkiv, Ukraine
Date of birth: December 27, 1988
Marital status: married (1 child)
Address: Kavli Institute of Nanoscience,
Delft Univesity of Technology,
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ORCID: 0000-0002-5313-5035
Languages: English, Ukrainian, Russian, (all fluent), French(B1), Dutch(B1), German(A2)

Expertise:

Computational physics, condensed matter physics, quantum many-body physics and strongly-correlated systems, tensor networks, quantum phase transitions, conformal field theory, quantum simulators, quantum magnetism, chiral melting, constrained systems (non-abelian anyons, quantum dimers and quantum loops, supersymmetric fermionic models), low-dimensional quantum systems, Rydberg atoms, topological phases, systems with multi-component Hilbert space, comb tensor networks, disorder, infinite randomness

Education:

04/13 – 04/17 Docteur ès sciences, Institute of Physics, École Polytechnique Fédérale de Lausanne,
Supervisor: prof. Frédéric Mila
Thesis Title: ***Dimerization and exotic criticality in spin-S chains***
Private defense: 21/02/2017; Public defense: 23/03/2017
Distinction from Doctoral School of Physics, EPFL

08/11 – 02/13 Master in Physics, École Polytechnique Fédérale de Lausanne,
Supervisor: prof. Frédéric Mila
Thesis Title: ***Topological phase transitions in spin ladders***

09/07 – 07/11 BSc in Applied Physics with First Class Honors, V.N.Karazin Kharkiv National University, Department of Theoretical Nuclear Physics
Supervisor: Sergey I. Shevchenko; Thesis Title: *Description of the electrons-holes superfluidity in terms of the order parameter*

09/00 – 06/07 High School Certificate with First Class Honors

Employment:

02/26(eplanned)- ERC Research Fellow at the University of Oxford, UK

05/24-now **Associate Editor** of the Physical Review Research of American Physical Society

01/21-01/26(planned) **Assistant professor,** Kavli Institute of Nanoscience, Faculty of Applied Sciences, Delft University of Technology, Netherlands

01/19-12/20 **Postdoc** in the group of **prof. P.Corboz** at the University of Amsterdam, Netherlands. The work has been supported by the Swiss National Science Foundation (grant number P400P2_183847) and by prof. Corboz's funds.

05/17-12/18 **Postdoc** in the group of **prof. S.R. White** at the University of California, Irvine, USA. The work has been supported by the Swiss National Science Foundation (grant number P2ELP2_172271) and by prof. White's funds.

04/13 – 04/17 **Doctoral assistant** at the Chair of condensed matter theory, Institute of Physics, École Polytechnique Fédérale de Lausanne, Supervisor: prof. Frédéric Mila

Selected Awards:

01/23-12/24 **Visiting professor,** Université Paul Sabatier, Toulouse, France
11/21 **Minerva prize** by Dutch Physics Council and Netherlands' Physical Society (https://dutchphysicscouncil.nl/613-4)
12/17 **Distinction from the Doctoral School of Physics**, EPFL for the thesis *Dimerization and exotic criticality in spin-S chains*
10/11 – 02/13 **Excellence scholarship** provided by École Polytechnique Fédérale de Lausanne
09/07 – 06/11 Government scholarships for university students with outstanding results
09/06 – 08/08 **2xPresident of Ukraine Scholarships**
09/03 – 06/11 Several diploma including 1st and 2nd prizes in Olympiads in Physics; 1st prize in Ukrainian Competition of Research projects

Grants and funding (personal):

02/26-01/31 **ERC starting Grant EUR 1.92M**, from the European Research Council for the project "Advancing the theory of quantum phase transitions in the era of quantum computing".

01/24-12/25 USD 123k from **Julian Schwinger Foundation (USA)** for the project "Challenging the theory of Mott transitions"

02/19-09/20 PostdocMobility by the **Swiss National Science Foundation**, University of Amsterdam, The Netherlands. Project title: Further development of infinite Projected Entangled Pair States (iPEPS): network of clusters and hard constraints

04/17-09/18 EarlyPostdocMobility by the **Swiss National Science Foundation**, University of California, Irvine, USA. Project title: Efficient Density Matrix Renormalization Group (DMRG) algorithm for two-dimensional systems and its applications.

08/25 1M CPU hours by SURFSARA national supercomputing cluster Snellius (EINF-15112)
01/24 1M CPU hours by SURFSARA national supercomputing cluster Snellius (EINF-8242)
02/23 GBP 9.5k from IQTN/**EPSRC** for the workshop "Tensor networks for constrained systems";
08/22 1M CPU hours by SURFSARA national supercomputing cluster Snellius (EINF 3879);
02/22 100k CPU hours by SURFSARA national supercomputing cluster Lisa (EINF 2722);
02/22 Aspasia EUR 120k; Awarded by Dutch Research council **NWO**; not accepted by TUDelft.
02/21 500k CPU hours by SURFSARA national supercomputing cluster Cartesius (EINF 1137)
02/21 100k CPU hours by SURFSARA national supercomputing cluster Lisa (EINF 1137)

Collective grants and networks:

10/25-09/28 Collaborator on the Spanish National Grant "TEnsor networks, Temporal entanglement, and the Real-time dynamics of out-of-Equilibrium quantum System" led by L.Tagliacozzo; EUR 192k.

04/2025- "Entanglement scaling and quantum phases is a supercondicting quantum dot chain", together with M.Wimmer (TUDelft); EUR 317k from SUMMIT-Quantum Limits (NWO)

08/2023 – now **The Kavli innovation award:** a consortium of 13 PI at TUDelft; USD 5M
https://www.tudelft.nl/en/2023/tnw/5-million-in-quest-for-missing-link-in-quantum-communication

10/22-now "Materials for the quantum age", a consortium of 43 PIs and 34 PhD and postdocs, supported by Dutch research council (NWO), https://qumat.org/people/

02/22-now Partner of the **International Quantum Tensor Networks**, (seeding funds from EPSRC)
https://iqtn.phys.strath.ac.uk/

01/2021-now Member of the **European Tensor Network** (quantumtensor.pks.mpg.de)
2013-2017 Member of **MaNEP** network and Swiss National Science Foundation

Publications:

37. Aman Sharma, Mithilesh Nayak, **Natalia Chepiga**, and Frédéric Mila
Excitations and dynamical structure factor of J1-J2 spin-3/2 and spin-5/2 Heisenberg spin chains
Phys. Rev. B 112, 104401 (2025)

36. Niels T.Pronk, Bowy La Riviere, **Natalia Chepiga**
Deconfined quantum criticality in a frustrated Haldane chain with single-ion anisotropy
Phys. Rev. B **Letter** 111, L220412 (2025), **Editor's Suggestion**

35. Jose Soto Garcia, **Natalia Chepiga**,
Numerical investigation of quantum phases and phase transitions in a two-leg ladder of Rydberg atoms
Phys. Rev. Research 7 (1), 013215 (2025)

34. Bowy La Riviere, **Natalia Chepiga**,
Z4 transitions in quantum loop models on a zig-zag ladder
SciPost Phys. 17, 144 (2024)

33. **Natalia Chepiga,**
Probing universal critical scaling with scan-DMRG
Phys. Rev. B 110, 144401 (2024)

32. Jose Soto Garcia, **Natalia Chepiga,**
Resolving chiral transition in Rydberg arrays with quantum Kibble-Zurek mechanism and finite-time scaling
Phys. Rev. B 110, 125113 (2024)

31. **Natalia Chepiga,**
Realization of Wess-Zumino-Witten transitions with levels k=6 and k=4 in a frustrated spin-3 chain;
Phys. Rev. B 109, 214403 (2024)

30. **Natalia Chepiga**,
Tunable quantum criticality in multi-component Rydberg arrays;
Phys. Rev. Lett. 132, 076505 (2024)

29. **Natalia Chepiga**, Nicolas Laflorencie,
Resilient infinite randomness criticality for a disordered chain of interacting Majorana fermions;
Phys. Rev. Lett. 132, 056502 (2024)

28. Bernhard Lüscher, Frederic Mila, **Natalia Chepiga**,
Critical properties of the quantum Ashkin-Teller chain with chiral perturbations;
Phys. Rev. B 108, 184425 (2023)

27. Zakaria Jouini, **Natalia Chepiga**, Loic Herviou, Frederic Mila,
Emergent U(1) symmetry in non-particle-conserving 1D models;
Phys. Rev. B 108, 205145 (2023)

26. **Natalia Chepiga**,
Critical properties of the Majorana chain with competing interactions;
Phys. Rev. B 108, 054509 (2023)

25. **Natalia Chepiga**, Nicolas Laflorencie,
Topological and quantum critical properties of the interacting Majorana chain;
SciPost Phys. 14, 152 (2023)

24. **Natalia Chepiga**, Frédéric Mila,
Eight-vertex criticality in the interactive Kitaev chain;
Phys. Rev. B 107, L081106 (2023)

23. **Natalia Chepiga**,
From Kosterlitz-Thouless to Pokrovsky-Talapov transitions in spinless fermions and spin chains with next-nearest-neighbor interactions;
Phys. Rev. Research 4, 043225 (2022)

22. Ivo A. Maceira, **Natalia Chepiga**, Frédéric Mila,
Conformal and chiral phase transitions in Rydberg chains;
Phys. Rev. Research 4, 043102 (2022)

21. **Natalia Chepiga,**
Critical properties of quantum three- and four-state Potts models with boundaries polarized along the transverse field
SciPost Phys. Core **5**, 031 (2022)

20. **Natalia Chepiga**, Ian Affleck, Frédéric Mila,
From SU(2)_5 to SU(2)_3 Wess-Zumino-Witten transitions in a frustrated spin-5/2 chain
Phys. Rev. B 105, 174402 (2022); **Editors' Suggestion**

19. **Natalia Chepiga,** Jiří Minář, Kareljan Schoutens,
Supersymmetry and multicriticality in a ladder of constrained fermions
SciPost Phys. 11, 059 (2021)

18. **Natalia Chepiga** and Frédéric Mila,

Lifshitz point at commensurate melting of 1D Rydberg atoms
Phys. Rev. Research, 3, 023049 (2021)

17. **Natalia Chepiga** and Frédéric Mila,
Kibble-Zurek exponent and chiral transition of the period-4 phase of Rydberg chains
Nature Communications, 12, 414 (2021)

16. Mario Motta, Claudio Genovese, Fengjie Ma, Zhi-Hao Cui, Randy Sawaya, Garnet Kin-Lic Chan, **Natalia Chepiga,** Phillip Helms, Carlos Jimenez-Hoyos, Andrew J. Millis, Ushnish Ray, Enrico Ronca, Hao Shi, Sandro Sorella, Edwin M. Stoudenmire, Steven R. White, Shiwei Zhang (Simons collaboration on the many-electron problem)
Ground-state properties of the Hydrogen chain: insulator-to-metal transition, dimerization, and magnetic phases
Phys. Rev. X 10, 031058 (2020)

15. **Natalia Chepiga**, Steven R. White,
Critical properties of a comb lattice
SciPost Phys. 9, 013 (2020)

14. **Natalia Chepiga**, Ian Affleck, and Frédéric Mila,
Floating, critical, and dimerized phases in a frustrated spin-3/2 chain
Phys. Rev. B 101, 174407 (2020)

13. Laurens Vanderstraeten, Elisabeth Wybo, **Natalia Chepiga,** Frank Verstraete, and Frédéric Mila,
Spinon confinement and deconfinment in a spin-1 chain
Phys. Rev. B 101, 115138 (2020);

12. **Natalia Chepiga** and Frédéric Mila,
Dimerization and effective decoupling in two spin-1 generalizations of the spin-1/2 Majumdar-Ghosh chain
Phys. Rev. B 100, 104426 (2019)*;*

11. **Natalia Chepiga** and Steven R. White,
Comb tensor networks
Phys. Rev. B 99, 235426 (2019)

10. **Natalia Chepiga** and Frédéric Mila,
DMRG investigation of constrained models: from quantum dimer and quantum loop ladders to hard-boson and Fibonacci anyon chains
SciPost Phys. 6, *033 (2019);*

9. **Natalia Chepiga** and Frédéric Mila,
Floating phase versus chiral transition in a 1D hard-boson model
Phys. Rev. Lett. 122, 017205 (2019)

8. **Natalia Chepiga** and Frédéric Mila,
Rigorous decoupling between edge states in frustrated spin chains and ladders
Phys. Rev. B 97, 174434 (2018)

7. **Natalia Chepiga** and Frédéric Mila,
Exact zero modes in frustrated Haldane chain

Phys. Rev. B 96, 060409 (2017), **Rapid Communication**

6. **Natalia Chepiga** and Frédéric Mila,
Excitation spectrum and Density Matrix Renormalization Group iterations
Phys. Rev. B 96, 054425 (2017)

5. L.Wang, **N.Chepiga**, D.-K.Ki, L.Li, F.Li, W.Zhu, Y.Kato, O.S.Ovchinnikova, F.Mila, I.Martin, D.Mandrus, A.F.Morpurgo,
Controling the topological sectors of magnetic solitons in exfoliated $Cr_{1/3}NbS_2$ crystals
Phys. Rev. Lett. 118, 257203 (2017), Editor's Suggestion

4. **Natalia Chepiga**, Ian Affleck, and Frédéric Mila,
Spontaneous dimerization, critical lines, and short-range correlations in a frustrated spin-1 chain
Phys. Rev. B 94, 205112 (2016)

3. **Natalia Chepiga**, Ian Affleck, and Frédéric Mila,
Comment on "Frustration and Multicriticality in the Antiferromagnetic Spin-1 Chain"
Phys. Rev. B 94, 136401 (2016)

2. **Natalia Chepiga**, Ian Affleck, and Frédéric Mila,
Dimerization transitions in spin-1 chains
Phys. Rev. B 93, 241108 (2016), **Rapid Communication**

1. **Natalia Chepiga**, Frédéric Michaud, and Frédéric Mila,
Berry phase investigation of spin-S ladders
Phys. Rev. B 88, 184418 (2013)

Pre-prints:

1. Manu Canals, **Natalia Chepiga**, Luca Tagliacozzo, A tensor network formulation of Lattice Gauge Theories based only on symmetric tensors; arXiv:2412.16961

2. Jose Soto Garcia, **Natalia Chepiga**, The quantum Kibble-Zurek mechanism: the role of boundary conditions, endpoints and kink types; arXiv:2412.20186

3. Bowy La Riviere, Rik Mulder, Natalia Chepiga, Exact zero modes in the interacting Majorana X- and Y-junctions, arXiv: 2506.10898

4. Jose Soto Garcia, **Natalia Chepiga**, Ising versus infinite randomness criticality in arrays of Rydberg atoms trapped with non-perfect tweezers; arXiv:2506.11985

5. Aman Sharma, Mithilesh Nayak, **Natalia Chepiga**, Henrik M. Rønnow, Frédéric Mila, Confinement, deconfinement, and bound states in the spin-1 and spin-3/2 generalizations of the Majumdar-Ghosh chain; arXiv:2509.06720

6. Julien Fitouchi, **Natalia Chepiga**, Commensurate-incommensurate Mott transition without magnetic field: emergence of nematic Luttinger liquid in XXZ chain; arXiv:2510.05988

Invited conference talks (32+3 planned):

09/26 (upcoming) Eastern European Workshop on Quantum Science and Technology, Poland
07/26 (upcoming) Quantum Platforms: Implementations and Theoretical Insights, Crete, Grece

02/26 (upcoming) Quantum Workshop Coventry 2026 , UK

11/25 **Keynote** at Øredev Developers conference, Malmo, **Sweden,** *Networking for quantum: how simulations help us to design the future*
10/25 COOLMAG 2025, Košice, **Slovakia**, *"C-IC transition without magnetic field"*
10/25 Delta-ITP meeting, Amsterdam, Netherlands, *"Probing quantum criticalities with Kibble-Zurek mechanism"*
09/25 ICTP-SAIFR workshop, São Paulo, **Brazil**, *"Probing quantum criticalities with Kibble-Zurek mechanism"*
05/25 Entanglement in Many-body Quantum Matter: Dynamics, Dissipation, Equilibration, **ESI, Vienna**, Austria, *Tensor network perspectives of quantum Kibble-Zurek mechanism*
05/25 Quantum and Networking (DFG Research Unit FOR 5522), Göttingen, Germany, *Scan-DMRG*
02/25 Aqumics : Advanced quantum materials for magnetic cooling and quantum information science, Cergy, France, *Dimerization transition in spin-S chains*
05/24 Theories, Experiments and Numerics on Gapless Quantum Many-body Systems, **KITP**, **Santa Barbara**, USA, *Tunable quantum criticality in multi-component Rydberg arrays*
05/24 "Bridging the Gap between Classical & Quantum Simulation", **Lorentz Center**, The Netherlands; *Tunable quantum criticality: Challenging quantum computers with classical simulations.*
04/24 TUM-IAS workshop, Garching, Germany, *Resilient infinite randomness for interacting Majorana fermions*
01/24 **Plenary meeting of the International Quantum Tensor Network**, Glasgow, UK, *Tunable quantum criticality in multi-component Rydberg arrays*
11/23 "Chaos and information dynamics in quantum many-body systems", **Ettore Majorana Center**, Erice, Sicily, *Resilient infinite randomness criticality for interacting Majorana fermions*
11/23 "Quantum information: theory and applications", Paris, France, *Tunable quantum criticality in multi-component Rydberg arrays*
09/23 "Quantum many-body methods in cond-mat systems", **RWTH Aachen**, Germany, *The power of Friedel oscillations. Critical properties of interacting Majorana chains*
09/23 **Korrelationstage** 2023, Dresden, Germany, *Resilient infinite randomness criticality for a disordered chain of interacting Majorana fermions*
08/23 **NG SCES** 2023, Lido di Fermo, Italy, *9 ½ phases of interacting Majorana chains*
08/23 Entanglement in strongly correlated systems, **Benasque**, Spain, *Critical properties of interacting Majorana fermions*
08/23 The Grete Hermann Network Workshop, Wuerzburg, Germany, *When Kosterlitz and Thouless meet Pokrovsky and Talapov*
07/23 JSF Workshop on the fermion sign problem, **Peyresq**, France, *An odd sequence of WZW criticalities in a frustrated spin-5/2 chain*
06/23 "Quantum Materials: Experimental Enigmas and Theoretical Challenges", **Aspen**, USA, *When Kosterlitz and Thouless meet Pokrovsky and Talapov – a computational enigma*
06/23 "Exotic Phases, Gauge Field Theories and Dynamics in Systems with Constraints", **Aspen**, USA, *Introduction to Constrained tensor networks*
11/22 "Entanglement Scaling and Criticality with Tensor Networks", **Bernoulli Center**, Switzerland, *Critical properties of an interacting Majorana chain. The power of Friedel oscillations*
10/22 "Symmetry and Duality in Quantum Many-Body Systems," Ghent, Belgium, *Dual boundary conditions in minimal models*
09/22 "Computational aspects of Tensor Networks", **Erwin Schrodinger International Institute**, Austria, *Eight vertex criticality in interacting Kitaev chains*
01/22 **Physics@Veldhoven**, *Lifshitz point or Why the transition becomes chiral?*
10/21 **CECAM flagship** workshop: Computational materials discovery of unconventional magnets, Lausanne, Switzerland, *Floating phases in quantum spin chains*
02/21 Entanglement in Strongly Correlated Systems, Benasque, Spain, *Supersymmetric point in a*

ladder of constrained fermions

12/20 European Tensor Network online series, *Chiral transitions in chains of Rydberg atoms*

11/19 Delta-ITP triangle meetings: Quantum and Topological Matter, University of Utrecht, The Netherlands, *Comb tensor networks*

03/19 **DPG Frühjahrstagung 2019,** Regensburg, Germany, *DMRG investigation of constrained models: from quantum dimer and quantum loop ladders to hard-boson and Fibonacci anyons*

02/19 Constrained Many-body Dynamics, **MPI PKS, Dresden**, Germany, *DMRG investigation of constrained models: from quantum dimer and quantum loop ladders to hard-boson and Fibonacci anyon Quantum many-body chains*

06/18 TOPMAT, Paris-Saclay, France, *DMRG investigation of quantum dimer ladders*

Invited lectures at PhD schools (9+1 planned):

11/25 (upcoming) European Tensor Network School, Goettingen**, Germany**

08/25 Graduate Lectures "Introduction to Tensor Networks", **Weizmann institute**, Israel

03/25 Distinguished lecturer for Quantum Digital Twins Masterclass, **NPL, UK**,*"Constrained Tensor Networks and what one can do with them"*

09/24 **Les Houches** School "Frontiers of Condensed Matter"

06/24 8th **Les Houches** School in Computational Physics: Variational Approaches for quantum matter in and out of equilibrium,*"Constrained Tensor Networks and what one can do with them"*

09/23 Topological Quantum Matter School, Leipzig, **Germany**, *Chiral transitions in Rydberg atoms*

09/23 European Tensor Network school, Abingdon, **UK**, *Introduction to MPS*

05/23 DRSTP condensed matter theory school, Callantsoog, **The Netherlands**; *Quantum phase transitons (5 lectures, 1.5h each)*

04/23 lecture at the JuniorClub at the University of Paul Sabatier Toulouse, **France**, *bCFT with DMRG*

07/19 Computational Approaches to Quantum Many-body Problems, ISSP, Kashiwa, **Japan**, *Practical introduction to MPS + Comb tensor networks + DMRG for constrained models (in total: 3 hours of lectures)*

Invited seminars and colloquia (33 + 3 planned):

03/26(upcoming) Cambridge (UK)

11/25(upcoming) Sorbonne University (France)

11/25(upcoming) CEA Saclay (France)

04/25 University of **Tuebingen, Germany**;
colloquium *Tunable phase transitions in Rydberg-based quantum simulators*

02/25 iQuISE Seminar at **MIT, USA**; *Tunable phase transitions in Rydberg-based quantum simulators*

02/25 University of Strathclyde, **Glasgow, UK**;
colloquium *Tunable phase transitions in Rydberg-based quantum simulators*

11/24 **EPFL**, Switzerland; *Probing universal critical scaling with scan-DMRG*

10/24 University of **Zurich**, Switzerland; *Probing universal critical scaling with scan-DMRG*

10/24 University of **Innsbruck**, Austria; *Tunable quantum criticality in Rydberg atoms*

09/24 **CNRS** LPT Toulouse, France, *Probing universal critical scaling with scan-DMRG*

03/24 Kharkiv National University, Ukraine; *Tunable quantum criticality in Rydberg atoms*

03/24 **Flatiron Institute,** USA; *Tunable quantum criticality in Rydberg atoms: challenging quantum simulators with classical computers*

03/24 **CEA-Saclay,** France; *Tunable quantum criticality in Rydberg atoms*

01/24 **TUWien**, Austria; *Tunable chiral transitions in Rydberg atoms*

01/24 University of **Goettingen**, Germany; host: S.Manmana; *(Tunable) chiral transitions in Rydberg atoms*

09/23 Seminar at **CNRS** LPT Toulouse, France, *(Tunable) chiral transitions in Rydberg atoms*

05/23 University of **Geneva**, Switzerland, *Critical properties of the interacting Majorana chains*

04/23 **CNRS** LPT Toulouse, France, *Critical properties of the interacting Majorana chains*

01/23 Vision Seminar at TUDelft; *When Kosterlitz and Thouless meet Pokrovsky and Talapov*

11/22 **CNRS** LPT Toulouse; host: Nicolas Laflorencie; *When Kosterlitz and Thouless meet Pokrovsky and Talapov*

11/22 Seminar at **Nijmengen**, The Netherlands; host: A.Bagrov; *When Kosterlitz and Thouless meet Pokrovsky and Talapov*

06/22 Physical Sciences Seminar at **ISTA**, Austria; host: Maksym Serbyn; *Supersymmetry and multicriticality in a ladder of constrained fermions*

06/22 **TUWien**, Austria; host: Julian Leonard; *Chiral transitions in chains of Rydberg atoms*

12/21 Utrecht Condensed Matter Theory Seminar, NL,*Chiral transitions in chains of Rydberg atoms*

10/21 **Brookhaven National Laboratory**, USA, *Probing conformal towers of states with Density Matrix Renormalization Group algorithms*

05/21 **ETH Zurich**, Switzerland; *Chiral transitions in chains of Rydberg atoms*

02/21 **Harvard** Condensed Matter Theory Seminar, USA; *Chiral transitions in chains of Rydberg atoms*

12/20 University of **Amsterdam**, The Netherlands; host: P.R.Corboz, *Constrained tensor networks: a new approach to quantum criticality*

02/20 TU Delft, The Netherlands; *Tensor network investigation of constrained models: from quantum dimer and quantum loop ladders to chains of Rydberg bosons*

06/19 **University of Nottingham**, UK; host: Juan P. Garrahan, *Constrained DMRG as a byway to investigate critical properties of frustrated magnets*

02/19 University of Amsterdam, The Netherlands; host: P.R.Corboz, *Floating phase versus chiral transition in constrained models*

10/18 University of California, **Irvine**, USA; host: Steven R.White, *Floating phase versus chiral transition in constrained models: from hard-boson chain to quantum dimer and quantum loop ladders*

03/18 HISKP, Universität **Bonn**, Germany; host: Corinna Kollath, D*MRG investigation of quantum dimer ladders*

02/18 **Max-Planck-Harvard** Institute for Quantum Optics, Garching, Germany; host: Ignacio Cirac, *Frustrated spin chains: exotic criticality, exact zero modes and quantum dimer model.*

11/17 **Perimeter Institute**, Waterloo, Canada; host: Guifre Vidal, *Spontaneous dimerization, critical lines and exact zero modes in frustrated spin-1 chain.*

10/17 University of **British Columbia**, host: Ian Affleck, *Exact zero modes in frustrated spin chains*

Contributed talks (19):

07/22 International conference on strongly correlated electron systems (**SCES**) 2022, Amsterdam, The Netherlands, *From SU(2)_5 to SU(2)_3 Wess-Zumino-Witten transitions in a frustrated spin-5/2 chain*

06/22 Highly Frustrated Magnetism (**HFM**) 2022, Paris, France, *From SU(2)_5 to SU(2)_3 Wess-Zumino-Witten transitions in a frustrated spin-5/2 chain*

01/21 Waiting for Highly Frustrated Magnetism 2021, Dresden, Germany, *Floating, critical and dimerized phases in a frustrated spin-3/2 chain*

12/20 Exploring quantum many-body physics with ultra-cold atoms and molecules, Bad Honnef, Germany, *Kibble-Zurek exponent and chiral transition of the period-4 phase of Rydberg chains*

02/20 Entanglement in Strongly Correlated Systems, Benasque, Spain,

Ashkin-Teller transition of Rydberg atoms with two-site blockade

01/20 Physics@Veldhoven 2020, Veldhoven, The Netherlands,
Simulating constrained models with tensor networks

09/19 Korrelationstage 2019, Dresden, Germany, *Comb tensor networks*

10/18 Topological phases in condensed matter and cold atom systems, Cargese, Corsica, France
Constrained DMRG as a byway to investigate critical properties of frustrated magnets

06/18 Trends in quantum magnetism, Bad Honnef, Germany,
DMRG investigation of quantum dimer ladders

02/18 Entanglement in Strongly Correlated Systems, Benasque, Spain,
DMRG investigation of quantum dimer ladders

11/17 Novel Quantum States in Condensed Matter 2017, Kyoto, Japan, *Spontaneous dimerization, critical lines, and exact zero modes in a frustrated spin-1 chain*

06/17 Many Electron Collaboration Summer School, Stony Brook, USA, *Excitation spectrum and Density Matrix Renormalization Group iterations*

02/17 Entanglement if strongly correlated systems, Benasque, Spain, *Dimerization and exotic criticality in spin-S chains*

09/16 Recent Progress in Low-Dimensional Quantum Magnetism, Lausanne, Switzerland, C*ritical lines and short-range correlations in a frustrated spin-1 chain*

07/16 Swiss Physical Society Meeting, Lugano, Switzerland, *Dimerization transitions in spin-1 chains*

07/16 Swiss Workshop on Materials with Novel Electronic Properties 2016, Les Diablerets, Switzerland, *Dimerization transitions in spin-1 chains*

05/16 Japan-Swiss Workshop 'Trends in Theory of Correlated Materials', PSI, Villigen, Switzerland, *Dimerization transitions in spin-1 chains*

10/14 Japan-Swiss Workshop 'Trends in Theory of Correlated Materials', Tokyo, Japan, *Berry phase investigation of spin-S ladders*

07/14 Swiss Physical Society Annual Meeting, Fribourg, Switzerland, *Berry phase investigation of spin-S ladders*

Poster presentations (8):

09/21 Quantum Field Theory at the Boundary, Mainz, Germany, *Boundary critical phenomena in the 4-state Potts model*

04/21 Korrelationstage 2021, Dresden, Germany, *Chiral transitions in chains of Rydberg atoms*

10/18 Topological phases in condensed matter and cold atom systems, Cargese, Corsica, France,
A comb tensor network

09/17 Korrelationstage 2017, Dresden, Germany,
Dimerization and exotic criticality in spin-S chains

09/16 8th International Conference on Highly Frustrated Magnetism, Taipei, Taiwan,
Dimerization transitions in spin-1 chains

01/15 Theory Winter School on New Trends in Frustrated Magnetism, Tallahassee, Florida, USA, *Frustration and spontaneous dimerization in spin-1 chain*

10/13 School on Advanced Algorithms for Correlated Quantum Matter, Würzburg, Germany,
Berry phase investigation of spin-S ladders

07/13 Swiss Workshop on Materials with Novel Electronic Properties, Les Diablerets, Switzerland, *Berry phase investigation of frustrated quantum magnets*

Event organization:

05/25-07/26 **Lorentz workshop** "Automated Reasoning for Quantum Mechanics" together with Alfons Laarman, Kuldeep Meel, and Robert Wille, Leiden, The Netherlands

07/24-01/25 Chair of the focus session “Tensor Networks: bridging quantum and classical computing” at

NWOPhysics-2025 (former Physics@Veldhoven)

05/22-08/25 The founder and the main organizer of **Delft Many-Body Workshop Series** (11 workshops); https://nchepiga.github.io/homepage/workshop; acquired funding from EPSRC (UK) and NWO (NL)

07/23-07/24 Topic chair of the International conference of Magnetism ICM2024, Bologna, Italy

10/23 The organizer of the IQTN/EPSRC funded workshop "Tensor networks for constrained systems" (https://iqtn.phys.strath.ac.uk)
02/22-05/24 Member of the program committee of International Quantum Tensor Network meetings (https://iqtn.phys.strath.ac.uk)

Refereeing for journals:
Nature, Nature Reviews, Nature Communications, Communications Physics;
Physical Review Letters, Physical Review Research, Physical Review B;
SciPost Physics; New Journal of Physics

Referee and panel member for funding agencies:
- Swiss National Science Foundation (SNSF)
- US Department of Energy (DOE)
- Dutch Research Council (NWO)

Teaching & supervision:

12/24-06/25	Lecturer for the course **Quantum Mechanics 2** (BSc) at TUDelft
12/23-12/25	Guest lectures in **Advanced Statistical Mechanics** (MSc) at TUDelft
05/23	Lecturer for the course on '**Quantum Phase Transitions**' at DRSTP postgraduate school, Callantsoog, Netherlands
02/22 – 06/25	Lecturer in '**Mechanics and Relativity**' (BSc) at TUDelft
02/22 – 06/25	Lecturer in '**Fairy Tails of Theoretical Physics**' (MSc) at TUDelft (advanced theory lectures on: supersymmetry; frustrated magnetism; duality)
09/14 – 01/17	Teaching Assistant in '**Physique Statistique I**' at EPFL
02/16 – 06/16	Teaching Assistant in '**Mathematical Methods for Physicists**' at EPFL
02/15 – 06/15	Teaching Assistant in '**Physique Statistique II**' at EPFL
09/13 – 12/13	Teaching Assistant in '**Statistiques et probabilités**' at EPFL
11/07 – 06/11	High School Teacher in Advanced Physics and Mathematics at Private Boiko School, Ukraine
08/08 – 08/09	Summer School Teacher for Granted Youth (supported by Kharkov City Council)

Dutch courses on teaching skills (UTQ):
04/21 DEVELOP, TU Delft, ~40 hours on the development of own courses from scratch
05/21 SUPERVISE, TU Delft, ~40 hours on how to manage the group and supervise students

Supervision
PhD students:
- Warre Missiaen, PhD thesis on quantum critical properties of interacting Majorana fermions, funded by NWO summit grant, TU Delft, Netherlands
- Julien Fitouchi, PhD thesis on unusual Mott transitions, funded by Julian Schwinger foundation, TU Delft, Netherlands
- Pietro Richelli, PhD thesis exploring edge effects with tree tensor networks, TU Delft, Netherlands
- Bowy La Rivière, PhD thesis on numerical investigation of non-magnetic quantum phase transitions with

constrained tensor networks, TU Delft, Netherlands
- Jose Soto Garcia, PhD thesis on dynamical properties of exotic quantum phase transitions, TU Delft, Netherlands

Undergraduate students:
- Luka van der Heiden, “Single-ion anisotropy in half-integer frustrated spin chains” TU Delft, Netherlands
- Filip Sfetcu „Bosonisation studies of frustrates spin-S ladders“
- Ioannis Angelo Tassioulas „Scan-DMRG technique beyond 1D“

Former students:
undergraduate:
- Niels Pronk, “Numerical investigation of frustrated Haldane chain with single-ion anisotropy” TU Delft
- Jesse van der Kooi, „Dynamics across deconfined quantum criticality in 1D” TU Delft
- Daan van der Veer, „Kibble-Zurek drive into a floating phase” TU Delft
- Rik Mulder, “Exact zero modes in chains of interacting Majorana fermions” TU Delft
- Wesley Brouwer “The effect of next-to-leading-order interactions in Majorana chains”; supervised together with Dr. Jonas Thies (Math department); TU Delft
- Bernhard Luescher, intern, “Critical properties of the chiral Ashkin-Teller model”, TU Delft

co-supervised:
- Ivo Maceira’s PhD project on chiral transitions in Rydberg atoms, EPFL, Switzerland (co-supervised);
- Randy Sawaya’s PhD project on Hubbard model with long-range interactions, University of California Irvine (co-supervised);
- Robin Kaech’s MSc thesis on critical Ising chains, EPFL (co-supervised);
- Guillaume Meyrat’s MSc project on quantum dimer model, EPFL (co-supervised);
- Samuel Gozel’s MSc thesis on dynamics in spin-3/2 chain, EPFL (co-supervised)

Member of committees:
09/23 Member of the poster prize committee at CT.QMAT 2023 school, Leipzig, Germany
08/23 Member of the poster prize committee at NG SCES 2023, Lido di Fermo, Italy
01/23 Member of the Minerva prize 2022 committee, The Netherlands
06/22 Member of the poster prize committee at Highly Frustrated Magnetism 2022, Paris, France
01/20 Member of the poster prize committee at Physics@Veldhoven 2020, Veldhoven, Netherlands
04/24 Appointment committee for a Delft Technology Fellowship at QuTech, TUDelft
07/21 Appointment committee for an assistant professor position at Kavli Institute, TUDelft
10/23-09/25 Member of the work-group “Education and outreach”, TUDelft

PhD committees:
11/25 Coraline Letouze, Sorbonne University, France (supervisors G. Radtke and B. Lenz)
09/25 Vladimir A. Zakharov, University of Leiden, Netherlands (supervisor C.Beenakker)
06/25 Yann in 't Veld, Radboud University, The Netherlands (supervisor M. Roesner)
12/24 David Aceituno Chávez, KTH Stockholm, Sweden (supervisor J.Bardarson)
06/24 Alvaro Donis Vela, University of Leiden, Netherlands (supervisor C.Beenakker)
03/21 Member of Schelto Crone’s, University of Amsterdam, Netherlands (supervisor – P.Corboz)

Undergraduate defense committee:
12/24 Saqar Khaleefah, TU Delft, Netherlands (supervisor – E.Greplova)
07/24 Matthijs Ates, TU Delft, Netherlands (supervisor – J.Thijssen)
06/24 Esther Teng,TU Delft, Netherlands (supervisor – S.Otte)
06/24 Sander de Bruyn, TU Delft, Netherlands (supervisors – N.Budko, J.Thijssen)
12/23 Member of Pelle Poelmann’s defense committee at TU Delft, Netherlands (supervisor – A.Artaud)

11/22 Expert at Luka van der Heiden's defence, TU Delft, Netherlands (supervisor – E.Pulvirenti)
07/22 Expert at Huang Tianyue's MSc defence, EPFL, Switzerland (supervisor – A.Lauchli)
07/22 Expert at Baptiste Demazure's MSc defence, EPFL, Switzerland (supervisor – F.Mila)
07/21 Expert at Bernhard Luescher's MSc defence, EPFL, Switzerland (supervisor – F.Mila)
06/21 Member of Isabel Postmes' MSc defense committee at TU Delft, Netherlands (supervisor – S.Conesa-Boj)

Outreach, volunteer and mentoring activities:

11/25(upcoming) Keynote speaker at Øredev Developers conference, Malmo, Sweden
09/25 **Press release** on the ERC STG award by the University of Oxford
02/24 **Press release** on publication of "*Tunable quantum criticality in multi-component Rydberg arrays*"
12/23 **SURF** advanced computing day, public talk **"**Challenging quantum simulators with classical computers"
11/23 Article by Kenna Hughes-Castleberry for **"Women of Quantum Technology"**, https://www.insidequantumtechnology.com/news-archive/women-of-quantum-technology-dr-natalia-chepiga-of-delft-university-of-technology/
10/23 DelftBlue **HPC summit**, public talk *"9 ½ phases of interacting Majorana chains"* www.tudelft.nl/en/events/2023/dcse/user-summit-2023
05/2023 **Interview** in honor of DelfBlue HPC anniversary www.tudelft.nl/en/stories/articles/supercomputing-power-for-racing-cars-and-quantum-states
01/2022 **Interview** for Nederlands Tijdschrift voor Natuurkunde

Since 2023: The member of Grete Hermann network of females in condensed matter physics
Since 2022: **The mentor** in EPFL's Alumni mentoring program

2016-2020 4 public lectures at the Boiko School, Kharkiv, Ukraine:
08/10 Environmental volunteer program in Vichy, France
07/10 Camp leader in the international volunteer project, Lyubotin, Kharkiv district, Ukraine
08/09 Volunteer in Summer Camp in Spangenberg, Germany
11/07 Team leader in Ukraine-China exchange program in Shitzyatjuan, China

References:
1. Prof. Frédéric Mila, École Polytechnique Fédérale de Lausanne, frederic.mila@epfl.ch
2. Prof. Nicolas Laflorencie, LPT Toulouse, laflo@irsamc.ups-tlse.fr
3. Prof. Frank Verstraete, Cambridge and UGhent, frank.verstraete@ugent.be
4. Prof. Philippe Corboz, University of Amsterdam, P.R.Corboz@uva.nl
5. Prof. Paul Fendley, University of Oxford, paul.fendley@physics.ox.ac.uk
6. Prof. Thierry Giamarchi, University of Geneva, Thierry.Giamarchi@unige.ch