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1 Personal data



1. **DATE AND PLACE OF BIRTH:** January 4 1979, Barcelona (Spain)
2. **NATIONALITY:** Spanish
3. **ADDRESSES:**
 - (1) Donostia International Physics Center (DIPC)
Manuel Lardizabal Ibilbidea, 4, 20018 Donostia, Gipuzkoa, Spain
 - (2) Multiverse Computing
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9. **TWITTER:** [@OrusRoman](https://twitter.com/OrusRoman)
10. **RESEARCHGATE:** www.researchgate.net/profile/Roman_Orus
11. **RESEARCHER-ID:** [A-3558-2012](https://orcid.org/0000-0002-4496-8115)
12. **ORCID-iD:** [0000-0002-4496-8115](https://orcid.org/0000-0002-4496-8115)
13. **RESEARCH INTERESTS:** Complex Quantum Systems, Tensor Networks, Quantum Technologies

2 Employment

1. **2019 - Today: Founder and CSO**, [Multiverse Computing](#), San Sebastián (Spain) and Toronto (Canada).
2. **2018 - Today: Ikerbasque Research Professor (full, tenured)**, [Donostia International Physics Center \(DIPC\)](#), San Sebastián (Spain).
3. **2017 - Today: Scientific advisor**, [Quantum for Quants - QWA](#), Barcelona (Spain).
4. **2017 - Today: Partner and advisory board member**, [Entanglement Partners SL](#), Barcelona (Spain).
5. **2019: Visiting Professor**, [Barcelona Supercomputing Center \(BSC\)](#), Barcelona (Spain).
6. **2013 - 2018: W1 Junior Professor in Condensed Matter Theory**, Johannes Gutenberg-Universität, Mainz (Germany).
7. **2017 - 2018: Visiting Professor** (2 months), Donostia International Physics Center (DIPC), San Sebastián (Spain).
8. **2016 - 2016: Visiting Professor** (2 months), Laboratoire de Physique Théorique, Université Paul Sabatier - CNRS, Toulouse (France).
9. **2012 - 2013: Postdoctoral Research Fellow**, Theory Division (I. Cirac) at the Max Planck Institut für Quantenoptik, Garching (Germany).
10. **2010 - 2012: Marie Curie Postdoctoral Fellow**, Theory Division (I. Cirac) at the Max Planck Institut für Quantenoptik, Garching (Germany).
11. **2008 - 2010: Australian Research Council (ARC) Postdoctoral Fellow**, School of Mathematics and Physics (G. Vidal) at the University of Queensland (Australia).
12. **2006 - 2007: Research Fellow** at academic level B, School of Mathematics and Physics (G. Vidal) at the University of Queensland (Australia).
13. **2002 - 2002: Research Assistant** (3 months), Departament d'Estructura i Constituents de la Matèria, Faculty of Physics, University of Barcelona (Spain).

3 Education

1. **2006: PhD in physics**, University of Barcelona (Spain).
 - ◇ Thesis title: “Entanglement, quantum phase transitions and quantum algorithms”. Supervisor: José Ignacio Latorre. Qualification: Excellent Cum Laude (best possible).
2. **2004: Diploma of Advanced Studies (DEA)**, University of Barcelona (Spain).
 - ◇ Supervisors: Rolf Tarrach and Roberto Emparan. Qualification: Excellent (best possible).
3. **2002: First Degree in Physics**, University of Barcelona (Spain).
 - ◇ Average qualification: 3.14, second best CV of my year.
4. **1997: Elementary and High School** at Maristas la Inmaculada in Barcelona (Spain).
 - ◇ Finished with best possible mark in all subjects.

4 Publications

4.1 Refereed Journal Articles

1. **“Fine-Grained Tensor Network Methods”**
P. Schmoll, S. S. Jahromi, M. Hörmann, K. P. Schmidt, **R. Orús**
arXiv:1911.04882, to appear in Physical Review Letters.
2. **“Topological \mathbb{Z}_2 RVB quantum spin liquid on the ruby lattice”**
S. S. Jahromi, **R. Orús**
Phys. Rev. B **101**, 115114 (2020); arXiv:1912.06215.
3. **“Topological order on the Bloch sphere”**
R. Liss, T. Mor, **R. Orús**
New J. Phys. **22**, 033023 (2020); arXiv:1812.00671.
4. **“Forecasting financial crashes with quantum computing”**
R. Orús, S. Mugel, E. Lizaso
Phys. Rev. A **99**, 060301 (2019); arXiv:1810.07690.
5. **“Tensor networks for complex quantum systems”**
R. Orús
Nature Reviews Physics **1**, 538-550 (2019); arXiv:1812.04011.
6. **“Quantum criticality on a chiral ladder: an SU(2) iDMRG study”**
P. Schmoll, A. Haller, M. Rizzi, **R. Orús**
Phys. Rev. B **99**, 205121 (2019); arXiv:1812.01311.
7. **“A universal tensor network algorithm for any lattice”**
S. S. Jahromi, **R. Orús**
Phys. Rev. B **99**, 195105 (2019); arXiv:1808.00680.
8. **“Tensor network annealing algorithm for two-dimensional thermal states”**
A. Kshetrimayum, M. Rizzi, J. Eisert, **R. Orús**
Phys. Rev. Lett. **122**, 070502 (2019); arXiv:1809.08258.
9. **“Quantum computing for finance: overview and prospects”**
R. Orús, S. Mugel, E. Lizaso
Reviews in Physics **4** (2019) 100028; arXiv:1807.03890.
10. **“Spin-1/2 Heisenberg antiferromagnet on the star lattice: competing valence-bond-solid phases studied by means of tensor networks”**
S. S. Jahromi, **R. Orús**
Phys. Rev. B **98**, 155108 (2018), selected as *Editor’s suggestion*; arXiv:1807.00318.
11. **“Infinite Projected Entangled-Pair State algorithm for ruby and triangle-honeycomb lattices”**
S. S. Jahromi, **R. Orús**, M. Kargarian, A. Langari
Phys. Rev. B **97**, 115161 (2018); arXiv:1711.04798.
12. **“A simple tensor network algorithm for two-dimensional steady states”**
A. Kshetrimayum, H. Weimer, **R. Orús**
Nature Communications **8**, 1291 (2017); arXiv:1612.00656.

13. **“Tensor network simulation of QED on infinite lattices: learning from (1+1)d, and prospects for (2+1)d”**
K. Zapp, **R. Orús**
Phys. Rev. D **95**, 114508 (2017); arXiv:1704.03015.
14. **“Holographic encoding of universality in corner spectra”**
C.-Yu Huang, T.-Chieh Wei, **R. Orús**
Phys. Rev. B **95**, 195170 (2017); arXiv:1702.01598.
15. **“Entanglement Continuous Unitary Transformations”**
S. Sahin, K. P. Schmidt, **R. Orús**
Europhysics Letters **117**, 20002 (2017); arXiv:1607.04645.
16. **“Kitaev honeycomb tensor networks: exact unitary circuits and applications”**
P. Scholl, **R. Orús**
Phys. Rev. B **95**, 045112 (2017); arXiv:1605.04315.
17. **“The spin-1/2 Kagome XXZ model in a field: competition between lattice nematic and solid orders”**
A. Kshetrimayum, T. Picot, **R. Orús**, D. Poilblanc
Phys. Rev. B **94**, 235146 (2016); arXiv:1608.00437.
18. **“Systematic construction of spin liquids on the square lattice from tensor networks with SU(2) symmetry”**
M. Mambrini, **R. Orús**, D. Poilblanc
Physical Review B **94**, 205124 (2016); arXiv:1608.06003.
19. **“Symmetry-protected intermediate trivial phases in quantum spin chains”**
A. Kshetrimayum, H-Hao Tu, **R. Orús**
Physical Review B **93**, 245112 (2016); arXiv:1511.06338.
20. **“Spin-S Kagome quantum antiferromagnets in a field with tensor networks”**
T. Picot, M. Ziegler, **R. Orús**, D. Poilblanc
Physical Review B **93**, 060407(R) (2016); arXiv:1508.07189.
21. **“The iPEPS algorithm, improved: fast full update and gauge fixing”**
H. N. Phien, J. A. Bengua, H. D. Tuan, P. Corboz, **R. Orús**
Physical Review B **92**, 035142 (2015); arXiv:1503.05345.
22. **“All spin-1 topological phases in a single spin-2 chain”**
A. Kshetrimayum, H-Hao Tu, **R. Orús**
Physical Review B **91**, 205118 (2015); arXiv:1412.3370.
23. **“Topological transitions from multipartite entanglement with tensor networks: a procedure for sharper and faster characterization”**
R. Orús, T.-Chieh Wei, O. Buerschaper, A. García-Saez
Physical Review Letters **113**, 257202 (2014); arXiv:1406.0585.
24. **“Topological Minimally Entangled States via Geometric Measure”**
O. Buerschaper, A. García-Saez, **R. Orús**, T.-Chieh Wei
Journal of Statistical Mechanics: Theory and Experiment P110099 (2014); arXiv:1410.0484.
25. **“Advances on Tensor Network Theory: Symmetries, Fermions, Entanglement, and Holography”**
R. Orús
European Physical Journal B **87**, 280 (2014); arXiv:1407.6552.
26. **“A Practical Introduction to Tensor Networks: Matrix Product States and Projected Entangled Pair States”**
R. Orús
Annals of Physics **349** (2014), 117-158; arXiv:1306.2164.
27. **“Geometric Entanglement in Topologically Ordered States”**
R. Orús, T.-Chieh Wei, O. Buerschaper, M. van den Nest
New Journal of Physics **16** (2014) 013015; arXiv:1304.1339.
28. **“Bounds on universal quantum computation with perturbed 2d cluster states”**
R. Orús, H. Kalis, M. Bornemann, K. P. Schmidt
Physical Review A **87**, 062312 (2013); arXiv:1211.4054.

29. **“Fate of the cluster state on the square lattice in a magnetic field”**
H. Kalis, D. Klagges, **R. Orús**, K. P. Schmidt
Physical Review A **86**, 022317 (2012); arXiv:1205.5185.
30. **“Comment on “Topological quantum phase transitions of attractive spinless fermions in a honeycomb lattice” by Poletti D. et al.”**
P. Corboz, S. Capponi, A. M. Läuchli, B. Bauer, **R. Orús**
Europhysics Letters **98**, 27005 (2012); arXiv:1204.4791.
31. **“Exploring corner transfer matrices and corner tensors for the classical simulation of quantum lattice systems”**
R. Orús
Physical Review B **85**, 205117 (2012); arXiv:1112.4101.
32. **“Breakdown of a perturbed \mathbb{Z}_N topological phase”**
M. D. Schulz, S. Dusuel, **R. Orús**, J. Vidal, K. P. Schmidt
New Journal of Physics **14** 025005 (2012); arXiv:1110.3632.
33. **“Intermediate Haldane phase in spin-2 quantum chains with uniaxial anisotropy”**
H.-Hao Tu, **R. Orús**
Physical Review B **84**, 140407(R) (2011); arXiv:1107.2911.
34. **“Effective field theory for the $SO(n)$ bilinear-biquadratic spin chain”**
H.-Hao Tu, **R. Orús**
Physical Review Letters **107**, 077204 (2011); arXiv:1104.0494.
35. **“Entanglement and $SU(n)$ symmetry in one-dimensional valence bond solid states”**
R. Orús, H.-Hao Tu
Physical Review B **83**, 201101(R) (2011); arXiv:1103.3994.
36. **“Robustness of a perturbed topological phase”**
S. Dusuel, M. Kamfor, **R. Orús**, K. P. Schmidt, J. Vidal
Physical Review Letters **106**, 107203 (2011); arXiv:1012.1740.
37. **“Phase diagram of the $SO(n)$ bilinear-biquadratic chain from many-body entanglement”**
R. Orús, T.-Chieh Wei, H.-Hao Tu
Physical Review B **84**, 064409 (2011); arXiv:1010.5029.
38. **“Implementing global abelian symmetries in projected entangled-pair state algorithms”**
B. Bauer, P. Corboz, **R. Orús**, M. Troyer
Physical Review B **83**, 125106 (2011); arXiv:1010.3595.
39. **“Geometric entanglement of one-dimensional systems: bounds and scalings in the thermodynamic limit”**
R. Orús, T.-Chieh Wei
Quantum Information and Computation Vol. 11, No. 7&8 (2011) pp. 0563 - 0573; arXiv:1006.5584.
40. **“Simulation of strongly correlated fermions in two spatial dimensions with fermionic Projected Entangled-Pair States”**
P. Corboz, **R. Orús**, B. Bauer, G. Vidal
Physical Review B **81**, 165104 (2010); arXiv:0912.0646.
41. **“Visualizing elusive phase transitions with geometric entanglement”**
R. Orús, T.-Chieh Wei
Physical Review B **82**, 155120 (2010) (also Virtual Journal of Quantum Information, Volume 10 Issue 10, and Virtual Journal of Nanoscale Science & Technology, Volume 22 Issue 17); arXiv:0910.2488.
42. **“Simulation of two dimensional quantum systems on an infinite lattice revisited: corner transfer matrix for tensor contraction”**
R. Orús, G. Vidal
Physical Review B **80**, 094403 (2009) (also Virtual Journal of Quantum Information, Volume 9 Issue 9); arXiv:0905.3225.
43. **“Finite-Size Geometric Entanglement from Tensor Network Algorithms”**
Q.-Q. Shi, **R. Orús**, J. O. Fjærestad, H.-Q. Zhou
New Journal of Physics **12** 025008; arXiv:0901.2863.

44. **“Numerical study of the hard-core Bose-Hubbard Model on an Infinite Square Lattice”**
J. Jordan, **R. Orús**, G. Vidal
Physical Review B **79**, 174515 (2009), selected as *Editors’ Suggestion* (also Virtual Journal of Quantum Information, Volume 9 Issue 5); arXiv:0901.0420.
45. **“First order phase transition in the anisotropic quantum orbital compass model”**
R. Orús, A. C. Doherty, G. Vidal
Physical Review Letters **102**, 077203 (2009) (also Virtual Journal of Nanoscale Science and Technology, Volume 19 Issue 9, and Virtual Journal of Quantum Information, Volume 9 Issue 3); arXiv:0809.4068.
46. **“Geometric Entanglement in a Valence-Bond-Solid State”**
R. Orús
Physical Review A **78**, 062332 (2008) (also Virtual Journal of Quantum Information, Volume 9 Issue 1); arXiv:0808.0938.
47. **“Equivalence of critical scaling laws for many-body entanglement in the Lipkin-Meshkov-Glick model”**
R. Orús, S. Dusuel, J. Vidal
Physical Review Letters **101**, 025701 (2008); arXiv:0803.3151.
48. **“Infinite time-evolving block decimation algorithm beyond unitary evolution”**
R. Orús, G. Vidal
Physical Review B **78**, 155117 (2008) (also Virtual Journal of Quantum Information, Volume 8 Issue 10, and Virtual Journal of Nanoscale Science and Technology, Volume 18 Issue 17); arXiv:0711.3960.
49. **“Universal geometric entanglement close to quantum phase transitions”**
R. Orús
Physical Review Letters **100**, 130502 (2008) (also Virtual Journal of Quantum Information, Volume 8 Issue 4); arXiv:0711.2556.
50. **“Ground state fidelity from tensor network representations”**
H-Q. Zhou, **R. Orús**, and G. Vidal
Physical Review Letters **100**, 080601 (2008); arXiv:0709.4596.
51. **“Classical simulation of infinite-size quantum lattice systems in 2 spatial dimensions”**
J. Jordan, **R. Orús**, G. Vidal, F. Verstraete, J. I. Cirac
Physical Review Letters **101**, 250602 (2008) (also Virtual Journal of Quantum Information, Volume 9 Issue 1); cond-mat/0703788.
52. **“Matrix Product States Algorithms and Continuous Systems”**
S. Iblisdir, **R. Orús**, J. I. Latorre
Physical Review B **75**, 104305 (2007); cond-mat/0610530.
53. **“Entropy and Exact Matrix Product Representation of the Laughlin Wave Function”**
S. Iblisdir, J. I. Latorre, **R. Orús**
Physical Review Letters **98**, 060402 (2007); cond-mat/0609088.
54. **“Half the entanglement in critical systems is distillable from a single specimen”**
R. Orús, J. I. Latorre, J. Eisert, M. Cramer
Physical Review A **73**, 060303 (2006) (also Virtual Journal of Quantum Information, Volume 6 Issue 6 and Virtual Journal of Nanoscale Science and Technology, Volume 13 Issue 25); quant-ph/0509023.
55. **“Simulation of many-qubit quantum computation with matrix product states”**
M. C. Bañuls, **R. Orús**, J. I. Latorre, A. Pérez, P. Ruiz-Femenía
Physical Review A **73**, 022344 (2006) (also Virtual Journal of Quantum Information, Volume 6 Issue 3); quant-ph/0503174.
56. **“Two Slightly-Entangled NP-Complete Problems”**
R. Orús
Quantum Information and Computation, Vol. 5, No. 6 (2005), pp. 449-455; quant-ph/0502022.
57. **“Entanglement and majorization in (1+1)-dimensional quantum systems”**
R. Orús
Physical Review A **71**, 052327 (2005), erratum-ibid **73**, 019904 (2006) (also Virtual Journal of Quantum Information, Volume 5 Issue 6, erratum-ibid Volume 6 Issue 2); quant-ph/0501110.

58. **“Entanglement entropy in the Lipkin-Meshkov-Glick model”**
J. I. Latorre, **R. Orús**, E. Rico and J. Vidal
Physical Review A **71**, 064101 (2005) (also Virtual Journal of Quantum Information, Volume 5 Issue 6); cond-mat/0409611.
59. **“Weakly-entangled states are dense and robust”**
R. Orús and R. Tarrach
Physical Review A **70**, 050101 (2004) (also selected Virtual Journal of Quantum Information, Volume 4 Issue 12); quant-ph/0404100.
60. **“Quantum Phase Transitions in Anti-ferromagnetic Planar Cubic Lattices”**
C. Wellard and **R. Orús**
Physical Review A **70**, 062318 (2004) (also Virtual Journal of Quantum Information, Volume 5 Issue 1); quant-ph/0401144.
61. **“Universality of Entanglement and Quantum Computation Complexity”**
R. Orús and J. I. Latorre
Physical Review A **69**, 052308 (2004) (also Virtual Journal of Quantum Information, Volume 4 Issue 5); quant-ph/0311017.
62. **“Adiabatic Quantum Computation and Quantum Phase Transitions”**
J. I. Latorre and **R. Orús**
Physical Review A **69**, 062302 (2004) (also Virtual Journal of Quantum Information, Volume 4 Issue 6); quant-ph/0308042.
63. **“Systematic Analysis of Majorization in Quantum Algorithms”**
R. Orús, J. I. Latorre and M. A. Martín-Delgado
European Physical Journal D **29**, 119-132 (2004); quant-ph/0212094.
64. **“Natural Majorization of the Quantum Fourier Transformation in phase-estimation algorithms”**
R. Orús, J. I. Latorre and M. A. Martín-Delgado
Quantum Information Processing Volume **1** Issue **4**, 283-302 (2002); quant-ph/0206134.

4.2 Preprints

1. **“Benchmarking global SU(2) symmetry in 2d tensor network algorithms”**
P. Schmoll, **R. Orús**
arXiv:2005.02748.
2. **“Thermal bosons in 3d optical lattices via tensor networks”**
S. S. Jahromi, **R. Orús**
arXiv:2005.00314.
3. **“Spin-1/2 kagome Heisenberg antiferromagnet with strong breathing anisotropy”**
S. S. Jahromi, **R. Orús**, D. Poilblanc, F. Mila
arXiv:1912.10756.
4. **“Simulation methods for open quantum many-body systems”**
H. Weimer, A. Kshetrimayum, **R. Orús**
arXiv:1907.07079.
5. **“Towards Prediction of Financial Crashes with a D-Wave Quantum Computer”**
Y. Ding, L. Lamata, M. Sanz, J. D. Martín-Guerrero, E. Lizaso, S. Mugel, X. Chen, **R. Orús**, E. Solano
arXiv:1904.05808.
6. **“Towards Pricing Financial Derivatives with an IBM Quantum Computer”**
A. Martin, B. Candelas, Á. Rodríguez-Rozas, J. D. Martín-Guerrero, X. Chen, L. Lamata, **R. Orús**, E. Solano, M. Sanz
arXiv:1904.05803, highlighted in MIT Technology Review.
7. **“A programming guide for tensor networks with global SU(2) symmetry”**
P. Schmoll, S. Singh, M. Rizzi, **R. Orús**
arXiv:1809.08180.
8. **“Mathematical Foundations of Matrix Syntax”**
R. Orús, R. Martin, J. Uriagereka
arXiv:1710.00372.

9. “**Language Design and Renormalization**”
A. Gállego, **R. Orús**
arXiv:1708.01525.

10. “**Topological Geometric Entanglement**”
R. Orús, T.-Chieh Wei
arXiv:1108.1537.

4.3 Proceedings

1. “**Management of Big Textual Data in Qualitative Research: Organizing the Relationships in a Typology based on Logical Properties**” - Refereed -
C. Jouis, M. Orús-Lacort, N. Durglishvili, **R. Orús**
MEDES '19: Proceedings of the 11th International Conference on Management of Digital EcoSystems, November 2019, Pages 277 – 284, Association for Computing Machinery, NY.
2. “**Towards Matrix Syntax**” - Refereed -
R. Martin, **R. Orús**, J. Uriagereka
Generative Syntax: Questions, Crossroads and Challenges, UAB (2017).

4.4 Other (outreach, opinion, etc)

1. “**La física del Lenguaje**” - Refereed -
R. Orús
To appear in ReGrOC
2. “**Sobre álgebra y sintaxis**” - Refereed -
R. Orús, J. Uriagereka
To appear in the Revista Española de Lingüística
3. “**Can we use Quantum Computers to Predict Financial Crashes?**”
R. Orús, Samuel Mugel, Enrique Lizaso
Medium, December 19th 2018
4. “**Quantum Computing and Finance**”
R. Orús, Samuel Mugel, Enrique Lizaso
Medium, August 17th 2018
5. “**Inside Quantum Matter and Beyond**”
R. Orús
Open Access Government, July 2018, pp.172-173.
6. “**Tensor Networks: Untangling the Mysteries of Quantum Systems**”
Scientia team and **R. Orús**
SCIENTIA 125, 2018.

4.5 Books

1. “**Entanglement, Quantum Phase Transitions and Quantum Algorithms**”
R. Orús
PhD Thesis, University of Barcelona, 2006.

4.6 In preparation (small selection)

1. “**Political forecasting as energy minimization of spin systems**”
Research paper.
2. “**Unconstrained Binary Optimization with Gaussian Boson Sampling**”
Research paper.
3. “**Matrix Syntax**”
Monography book.
4. “**Tensor Networks: Entanglement and the Structure of Complex Quantum Systems**”
Book, Oxford University Press (to be finished by March 2021).

4.7 Citations

Database	Total citations	h-index
Google Scholar	4698	31
Web of Science	2755	27

5 Awards, honours and fellowships

5.1 Academic

1. **2017: Ikerbasque Research Professorship**, Basque Government (Spain).
2. **2014: Early Career Prize**, European Physical Society.
3. **2009: Marie Curie Incoming International Fellowship**, European Commission.
4. **2008: Honourable mention in the Václav Votruba Prize for the best thesis in theoretical physics**, Doppler Institute (Prague, Czech Republic).
5. **2007: APD Postdoctoral Fellowship**, Australian Research Council.
6. **2007: Extraordinary Award of the PhD in Physics**, University of Barcelona (Spain).
7. **2006: Award of European Doctor in Physics**, University of Barcelona (Spain).
8. **2003: Extraordinary Award of the Degree in Physics**, University of Barcelona (Spain).
9. **2002: FPI Fellowship for PhD**, Ministerio de Educación y Ciencia (Spain).
10. **1997: Top Honors in High School**, Maristas la Inmaculada, Barcelona (Spain).

5.2 Business

1. **2020: Multiverse Computing, Finalist Emprendedor XXI Prize**, CaixaBank DayOne (Spain).
2. **2019: Multiverse Computing, Manuel Laborde Werlinden 1st Prize**, UPV/EHU and BIC Gipuzkoa (Spain).
3. **2019: Multiverse Computing, Finalist of Toribio Echevarria Prize**, Eibar Council and BIC Gipuzkoa (Spain).

6 Funding

6.1 Academic

1. **2019: Correlated ground states and unconventional superconductivity in two dimensional materials**
 - ◇ Gobierno Vasco, PIBA 2019-81
 - ◇ **R. Orús**, F. de Juan, M. Garcia-Vegniory.
 - ◇ 49.400€, 3-year funding.
2. **2019: Superconductividad exótica en materiales correlacionados: modelos, materiales y transiciones de fase**
 - ◇ Ministerio de Ciencia, Innovacion y Universidades, PGC2018-101988-A-C22
 - ◇ **R. Orús**, F. de Juan.
 - ◇ 96.800€, 3-year funding.
3. **2017: Symmetrische Tensor-Netzwerke für 2D-Quantenmaterie**
 - ◇ Deutsche Forschungsgemeinschaft (DFG), GZ OR 381/3-1
 - ◇ Sole chief investigator: **R. Orús**.
 - ◇ 197.200€, 3-year funding.
4. **2015: Gravity from qubits: the Anti-de Sitter / Tensor Network correspondence**
 - ◇ Johannes Gutenberg-Universität, inneruniversitäre Forschungsförderung (Stufe I)
 - ◇ Sole chief investigator: **R. Orús**.
 - ◇ 30.000€, for one year.

5. **2015: Entanglement in strongly correlated systems**
 - ◊ CECAM
 - ◊ D. Poilblanc, J. Vidal, **R. Orús**.
 - ◊ 13.000€, to organize a workshop at the Benasque Center of Science Pedro Pascual, February 14-27 2016.
6. **2015: Numerical Optimization of Tensor Networks**
 - ◊ Johannes Gutenberg-Universität, Center for Computational Sciences
 - ◊ **R. Orús**, T. Raasch, M. Rizzi.
 - ◊ 30.000€, for one year.
7. **2015: The Kagome Heisenberg Antiferromagnet: a Tensor Network Study**
 - ◊ Johannes Gutenberg-Universität, inneruniversitäre Forschungsförderung (Stufe I)
 - ◊ Sole chief investigator: **R. Orús**.
 - ◊ 14.900€, for 6 months.
8. **2014: Tensor-Netzwerke für Chirale Topologische Ordnung**
 - ◊ Deutsche Forschungsgemeinschaft (DFG), GZ OR 381/1-1
 - ◊ Sole chief investigator: **R. Orús**.
 - ◊ 172.600€, 3-year funding.
9. **2013: iPEPS Algorithms in GPUs: Development and Finite-Temperature Applications**
 - ◊ Deutscher Akademischer Austausch Dienst (DAAD)
 - ◊ Chief investigator: **R. Orús**. Taiwanese partner: Ying-Jer Kao.
 - ◊ 11.932€, for visits to the National Taiwan University during 2014 and 2015.
10. **2013: Topological Geometric Entanglement Beyond Integrable Models**
 - ◊ Deutscher Akademischer Austausch Dienst (DAAD)
 - ◊ Sole chief investigator: **R. Orús**.
 - ◊ 22.000€, for visits to the C. N. Yang Institute of Theoretical Physics, Stony Brook University (USA), during 2014 and 2015.
11. **2013: Tensor Networks for Chiral Topological Phases**
 - ◊ Johannes Gutenberg-Universität, inneruniversitäre Forschungsförderung (Stufe I)
 - ◊ Sole chief investigator: **R. Orús**.
 - ◊ 28.650€, for one year.
12. **2012: Networking Tensor Networks: Many-Body Systems and Simulations**
 - ◊ Deutsche Forschungsgemeinschaft (DFG), Intern. Wissenschaftliche Veranstaltungen, GZ OR 312/1-1
 - ◊ Investigators: **R. Orús**, M. C. Bañuls.
 - ◊ 24.000€, to organize a workshop at the Benasque Center of Science Pedro Pascual, May 7-19 2012.
13. **2008: A new simulation algorithm for quantum many-body systems: exotic states of matter from a quantum information perspective**
 - ◊ University of Queensland Early Career Researcher Project 2007002059
 - ◊ Sole chief Investigator: **R. Orús**.
 - ◊ AUD\$ 17,500 for two years.
14. **2008: Novel approaches to strongly correlated quantum systems in two dimensions**
 - ◊ Australian Research Council Discovery Project DP0878830
 - ◊ Chief Investigators: G. Vidal, J.O. Fjaerestad; APD Candidate: **R. Orús**; Partner Investigator: F. Verstraete (University of Vienna).
 - ◊ AUD\$ 200,000 (2008), AUD\$ 190,000 (2009), AUD\$ 185,000 (2010), with an APD Postdoctoral Fellowship.

6.2 Business

1. **2019: (DECLINED) Multiverse Computing**
 - ◊ Creative Destruction Lab
 - ◊ Stage One: Non-dilutive Stipend, CAD\$ 3,000 / month per founder in Canada (6 months)
 - ◊ Stage Two: USD\$ 40,000 at USD\$ 1.33M Valuation Cap.
2. **2019: Multiverse Computing**
 - ◊ Gobierno Vasco y Diputación de Gipuzkoa, Programa Txekintek / Ekintzaile
 - ◊ 50.000€, for 18 months.

7 Talks

7.1 Invited at conferences/workshops/meetings/schools

1. **2020: “Quantum and Quantum-Inspired Computing in Finance”**, Le Lab Quantique, online webinar, April 28th.
2. **2019: “2d systems and PEPS”**, Tensor Networks for Quantum Many-Body Systems (TENSOR19), San Sebastián (Spain), November 26th.
3. **2019: “Computación cuántica, una perspectiva empresarial”**, Jornada Cuántica, Club ARGO, Madrid (Spain), November 14th.
4. **2019: “Tensor networks and quantum computing: overview and recent developments”**, DIPC-MIPT Workshop, San Sebastián (Spain), November 7th.
5. **2019: “Computación cuántica, una perspectiva empresarial”**, Retina LTD - El País, Madrid (Spain), October 29th.
6. **2019: “Quantum algorithms in finance: extreme computing”**, South Summit, Madrid (Spain), October 3rd.
7. **2019: “Quantum Information and condensed matter”**, 4 lectures, Frontiers of Condensed Matter 2019, École de Physique des Houches, Les Houches (France), September 23rd–27th.
8. **2019: “The potential of machine learning and quantum computing in finance”**, machineByte Europe 2019, Paris (France), September 17th.
9. **2019: “Mesa de debate sobre tecnologías cuánticas y sus aplicaciones (Carlos Cordero -Fujitsu-, Román Orús -DIPC-, Lluís Torner -ICFO-, Moderated by Alfonso Rubio-Manzanares)”**, 33^o Encuentro de la Economía Digital y las Telecomunicaciones (Ametic), Universidad Internacional Menéndez Pelayo, Santander (Spain), September 3rd.
10. **2019: “La física del llenguatge”**, La ciència del llenguatge: projectes interdisciplinaris i la seva aplicació a l'aula de secundària; UPF, Barcelona (Spain), June 26th.
11. **2019: “Quantum computing for finance”**, Summer School on Quantum Technologies, Universidad Internacional Menéndez Pelayo, Santander (Spain), June 18th.
12. **2019: “Nuevos materiales y nuevas finanzas”**, Nuevas aplicaciones de la revolución cuántica; Enginyers Industrials de Catalunya, Barcelona (Spain), May 14th.
13. **2019: “On (some) mathematical aspects of tensor network states and optimization methods”**, The Mathematics of Quantum Information; University of Siegen, Siegen (Germany), March 21st.
14. **2018: “Quantum computing for financial problems”**, Quantum Computing Germany v1.0, Frankfurt (Germany), December 14th.
15. **2018: “News on tensor network algorithms: 2d phases, arbitrary lattices, open systems and SU(2) symmetry”**, Tensor Network States, Algorithms and Applications, RIKEN Advanced Institute for Computational Science, Kobe (Japan), December 5th.
16. **2018: “Introduction to MPS and PEPS”**, Tensor Networks and Entanglement, Galileo Galilei Institute (Florence), June 19th.
17. **2017: “Introduction to 2d PEPS”**, European Tensor Network School, Univ. Ghent (Ghent, Belgium), November 10th.
18. **2017: “Entanglement and Tensor Networks in Condensed Matter”**, APCTP School on Entanglement and Quantum Phase Transition, Postech (Pohang, South Korea), 6 lectures, 30th October – 4th November.
19. **2017: “Tensor network simulation of QED on infinite lattices: learning from (1+1)d, and prospects for (2+1)d”**, Tensor Networks from Simulation to Holography, DESY (Hamburg), October 5th.
20. **2017: “Quantum Information and condensed matter”**, 4 lectures, Frontiers of Condensed Matter 2017, École de Physique des Houches, Les Houches (France), September 25th–27th.
21. **2017: “Tensor network simulation of QED on infinite lattices: learning from (1+1)d, and prospects for (2+1)d”**, Progress in Diagrammatic Monte Carlo Methods for Quantum Field Theories in Particle-, Nuclear-, and Condensed Matter Physics, MITP (Mainz), September 20th.

22. **2017: “Introduction to PEPS and MERA”**, Progress in Diagrammatic Monte Carlo Methods for Quantum Field Theories in Particle-, Nuclear-, and Condensed Matter Physics, MITP (Mainz), September 19th.
23. **2017: “TNs for 2d quantum lattice systems: topological spin liquids, steady states, and corner spectra”**, Korrelationstage 2017 (Dresden), September 13th.
24. **2017: “Matrix Syntax”**, with R. Martin and J. Uriagereka, Generative Syntax: Questions, Crossroads and Challenges, UAB (Spain), June 23rd.
25. **2017: “Tensor network simulation of QED on infinite lattices: learning from (1+1)d, and prospects for (2+1)d”**, From Static to Dynamical Gauge Fields with Ultracold Atoms, Galileo Galilei Institute (Florence), June 5th.
26. **2017: “A simple tensor network algorithm for 2d steady states”**, Numerical methods for quantum optics 2017, CSIC (Madrid), January 26th.
27. **2016: “Progress in tensor network states and methods for quantum lattice systems”**, Quantum Many-Body Methods in Condensed Matter Systems, RWTH Aachen University (Germany), October 5th.
28. **2016: “Introduction to tensor network states and methods”**, Synergies between Mathematical and Computational Approaches to Quantum Many-Body Physics, ESI, Vienna (Austria), September 30th.
29. **2016: “Progress in tensor network states and methods for quantum lattice systems”**, Recent progress in low-dimensional quantum magnetism (LDQM2016), EPFL, Lausanne (Switzerland), September 12th.
30. **2016: “Simulating 2d systems with PEPS”**, International workshop on tensor networks and quantum many-body problems (TNQMP2016), ISSP, Kashiwa (Japan), July 1st.
31. **2016: “From qubits to entanglement, and then to MPS”**, International workshop on tensor networks and quantum many-body problems (TNQMP2016), ISSP, Kashiwa (Japan), June 30th.
32. **2016: “Kitaev honeycomb tensor networks: exact unitary circuits and applications”**, International workshop on tensor networks and quantum many-body problems (TNQMP2016), ISSP, Kashiwa (Japan), June 27th.
33. **2016: “Overview: from qubits to space-time”**, Emergent properties of space-time, CERN (Switzerland), June 20th.
34. **2016: “Language Combinatorics as Matrix Mechanics: Mathematical Derivation and Properties”**, Physics of Language, Sophia University, Tokyo (Japan), March 5th.
35. **2015: “Entanglement, tensor networks, and topological quantum order”**, Topological Phases in Condensed Matter and Cold Atom Systems, Institut d’Études Scientifiques de Cargèse (France), September 10th.
36. **2015: “Entanglement, tensor networks, and topological quantum order”**, Workshop and Symposium on DMRG Technique for Strongly Correlated Systems in Physics and Chemistry, at Natal (Brazil), June 25th.
37. **2015: “Entanglement, tensor networks, and topological quantum order”**, Mainz Miniworkshop, at the Johannes Gutenberg-Universität (Germany), May 23rd.
38. **2015: “Entanglement, tensor networks, and topological quantum order”**, International Workshop on New Frontier of Numerical Methods for Many-Body Correlations, Methodologies and Algorithms for Fermion Many-Body Problems at the University of Tokyo (Japan), February 20th.
39. **2014: “Topological transitions and minimally entangled states from multipartite entanglement with 2d PEPS”**, Tensor Network States: Algorithms and Applications, at the Institute of Physics, Chinese Academy of Sciences (China), December 4th.
40. **2014: “Introduction to Tensor Networks”**, 4th Les Houches School in Computation Physics: From quantum gases to strongly correlated systems at École de Physique des Houches, Les Houches (France), July 4th.
41. **2014: “Introduction to Tensor Networks”**, School on computational methods in quantum materials at Jouvence (Canada), June 5th.
42. **2014: “Geometric entanglement in topologically ordered states: theory and numerics”**, Mainz-Marburg Miniworkshop, at the Johannes Gutenberg-Universität (Germany), May 21st.
43. **2014: “Introduction to Tensor Networks”**, DPG Spring Meeting 2014 of the Condensed Matter Section, Tutorial Session ”Advanced Algorithms for Correlated Quantum Matter” at TU Dresden (Germany), March 30th.

44. **2013: “On the tensor network approach to quantum many-body systems”**, 5th R-ION Meeting at Johannes Gutenberg Universität Mainz (Germany), November 12th.
45. **2013: “2d infinite PEPS: recent results and future perspectives”**, CMSI International Workshop 2013: Recent Progress in Tensor Network Algorithms at RIKEN Advanced Institute for Computational Science, Kobe (Japan), October 16th.
46. **2013: “2d topological order: robustness and multipartite entanglement”**, Statistical Physics of Quantum Matter at National Taiwan University, Taipei (Taiwan), July 29th.
47. **2013: “Robustness of 2d Topological Order and Cluster States Using infinite PEPS”**, Mainz-Marburg Miniworkshop, at the Universität Marburg (Germany), July 11th.
48. **2013: “Robustness of 2d topological order and cluster states using infinite PEPS”**, Tensor network algorithms in computational physics and numerical analysis at ETH, Zurich (Switzerland), May 17th.
49. **2012: “Introduction to PEPS”**, DMRG101 Winter School at National Taiwan University, Taipei (Taiwan), December 8th.
50. **2012 “Robustness of 2d topological order and cluster states using infinite Projected Entangled Pair States methods”**, ICE-0 Workshop de Información Cuántica en España at CSIC, Madrid (Spain), September 18th.
51. **2012: “Tips to apply for a Marie Curie International Incoming Fellowship”**, Regional Workshop for 2012 Marie Curie Fellowship proposers: “Finishing touch” for your proposal, Max-Planck-Institut für Extraterrestrische Physik, Garching, (Germany), August 2nd.
52. **2011: “Tips to apply for a Marie Curie International Incoming Fellowship”**, Regional Workshop for 2011 Marie Curie Fellowship proposers: “Finishing touch” for your proposal at Max-Planck-Institut für Extraterrestrische Physik, Garching, (Germany), July 28th.
53. **2010: “Robustness of a topological phase”**, 10a Trobada de Nadal de Física Teòrica at University of Barcelona (Spain), December 20th.
54. **2010: “Simulation of infinite-size 2D quantum lattice systems: corner transfer matrices and fermionic systems”**, Tensor Network Workshop 2010 at Max Planck Institut Für Quantenoptik, Garching (Germany), January 29th.
55. **2009: “Simulation of infinite-size 2D quantum lattice systems: corner transfer matrices and fermionic systems”**, 9a Trobada de Nadal de Física Teòrica at University of Barcelona (Spain), December 21st.
56. **2009: “Progress on infinite TPS/PEPS algorithms”**, Numerical Approaches to Quantum Many-body Systems at Institute for Pure and Applied Mathematics (IPAM), University of California Los Angeles (UCLA) (USA), January 28th.
57. **2008: “Entanglement and the simulation of 2D systems”**, Workshop on Simulation at University of Barcelona (Spain), January 3rd.
58. **2007: “Entanglement and the simulation of 2D quantum systems”**, 7a Trobada de Nadal de Física Teòrica at University of Barcelona (Spain), December 20th.
59. **2006: “Tensor networks and the numerical study of quantum and classical systems on infinite lattices”**, 6a Trobada de Nadal de Física Teòrica at University of Barcelona (Spain), December 20th.
60. **2006: “Classical simulation of adiabatic quantum algorithms using matrix product states”**, Mathematical Aspects of Quantum Adiabatic Approximation Workshop at Perimeter Institute for Theoretical Physics, Waterloo (Canada), February 9th.
61. **2005: “Simulation of many-qubit quantum computation with matrix product states”**, MPQ Theory Group Workshop at Ringberg castle (Germany), April 6th.
62. **2004: “Entropy and Majorization in Quantum Spin Systems”**, Interregional meeting Barcelona-Montpellier-Zaragoza at University of Barcelona (Spain), September 17th.
63. **2004: “Informació i computació quàntiques”**, Encontres amb el tercer cicle at University of Barcelona (Spain), October 14th (advertised in the science and technology section of the Spanish newspaper “El País”).

7.2 Invited at other campuses

1. **2019: “TensorQ”**, ITER (Tenerife, Spain), September 20th.
2. **2019: “Infinite tensor networks for (1+1)d QFTs: lattice QED and chiral ladders”**, IFT (Madrid, Spain), May 27th.
3. **2018: “Quantum computing for finance: overview and prospects”**, UCM (Madrid, Spain), November 23rd.
4. **2018: “Kitaev honeycomb tensor networks: exact unitary circuits and applications”**, UAB (Barcelona, Spain), October 30th.
5. **2018: “Language is renormalization (and its implications in physics, linguistics and machine learning)”**, Donostia International Physics Center (Spain), April 4th.
6. **2018: “Language and renormalization”**, University of The Basque Country (Spain), January 8th.
7. **2017: “Tensor networks for quantum matter: basics, news and prospects”**, University of Greifswald (Germany), December 18th.
8. **2017: “Tensor networks: from qubits to spacetime through many-body systems”**, Max Planck Institute for Gravitational Physics (Albert Einstein Institute), Potsdam (Germany), November 24th.
9. **2017: “Tensor networks for quantum matter: basics, news and prospects”**, University of Braunschweig (Germany), November 21st.
10. **2017: “Tensor networks for quantum matter: basics, news and prospects”**, University of Barcelona, November 14th.
11. **2017: “Tensor networks for quantum matter: basics, news and prospects”**, ICFO (Barcelona), June 22nd.
12. **2017: “Tensor networks for quantum matter: basics, news and prospects”**, UAB (Barcelona), June 21st.
13. **2017: “Tensor networks for quantum matter: basics, news and prospects”**, Technion (Israel), May 16th.
14. **2017: “Tensor networks for quantum matter: basics, news and prospects”**, Donostia International Physics Center (Spain), March 17th.
15. **2017: “Tensor networks for quantum matter: basics, news and prospects”**, University of The Basque Country (Spain), March 14th.
16. **2017: “Introduction to quantum information and condensed matter”**, 4-day course, Donostia International Physics Center (Spain), 4-day March 9th, 16th, 23th and 30th.
17. **2017: “Tensor networks for quantum matter: basics, news and prospects”**, University of Göttingen (Germany), January 30th.
18. **2017: “Progress in tensor network states and methods for quantum lattice systems”**, University of Hannover (Germany), January 23rd.
19. **2017: “Language combinatorics as matrix mechanics: mathematical derivation and properties”**, Centre de Lingüística Teòrica at Universitat Autònoma de Barcelona (Spain), January 10th.
20. **2017: “Some useful maths for linguists”**, Centre de Lingüística Teòrica at Universitat Autònoma de Barcelona (Spain), January 9th.
21. **2016: “Some useful maths for linguists”**, Centre de Lingüística Teòrica at Universitat Autònoma de Barcelona (Spain), December 21st.
22. **2016: “Kitaev honeycomb tensor networks: exact unitary circuits and applications”**, FAU Erlangen-Nürnberg (Germany), December 6th.
23. **2016: “Progress in tensor network states and methods for quantum lattice systems”**, University of Amsterdam (Netherlands), September 21st.
24. **2016: “Kitaev honeycomb tensor networks: exact unitary circuits and applications”**, MPI PKS, Dresden (Germany), June 9th.

25. **2016: “Quantum information: from qubits to space-time”**, 4-day course, University of Southampton, Southampton (UK), May 23rd-25th.
26. **2016: “Matter from entangled qubits: progress and perspectives in tensor networks”**, Universität Stuttgart (Germany), April 21st.
27. **2016: “Overview of algorithms for 2d PEPS. Part 2: environment”**, Laboratoire de Physique Théorique at Université Paul Sabatier, Toulouse (France), April 5th
28. **2016: “Overview of algorithms for 2d PEPS. Part 1: optimization”**, Laboratoire de Physique Théorique at Université Paul Sabatier, Toulouse (France), March 16th
29. **2016: “Linguistics, maths and physics: basics on vectors and matrices, analogies and beyond, and the Pauli-Chomsky group”**, 3-day lectures, embedded in the course “Projecting from the Lexicon” by Juan Uriagerka, Centre de Lingüística Teòrica at Universitat Autònoma de Barcelona (Spain), January 11th, 12th and 14th.
30. **2015: “Infinite-PEPS: updates, CTMs, topological order, and all that”**, University of Ghent (Belgium), October 21st.
31. **2015: “Entanglement, tensor networks, and topological quantum order”**, University of Princeton (USA), October 14th.
32. **2015: “Entanglement, tensor networks, and topological quantum order”**, University of Stonybrook (USA), October 12th.
33. **2015: “Entanglement, tensor networks, and topological quantum order”**, Freie Universität Berlin (Germany), July 16th.
34. **2015: “Entanglement, tensor networks, and topological quantum order”**, University of Cologne (Germany), July 10th.
35. **2015: “Entanglement, tensor networks, and topological quantum order”**, Laboratoire de Physique Théorique at Université Paul Sabatier, Toulouse (France), March 4th.
36. **2015: “Topological transitions and minimally entangled states from multipartite entanglement with 2d PEPS”**, Theoretical Nanophysics Group at LMU München (Germany), January 9th.
37. **2015: “Entanglement, tensor networks, and topological quantum order”**, at FAU Erlangen-Nürnberg (Germany), January 7th.
38. **2014: “Topological transitions and minimally entangled states from multipartite entanglement with 2d PEPS”**, DESY Zeuthen (Germany), December 15th.
39. **2014: “Topological transitions and minimally entangled states from multipartite entanglement with 2d PEPS”**, TU Dortmund (Germany), October 22nd.
40. **2014: “Introduction to Tensor Networks”**, 4-day course, Universidad del Pais Vasco, Bilbao (Spain), June 10th-13th.
41. **2014: “Geometric entanglement in topologically ordered states: theory and numerics”**, Universidad del Pais Vasco, Bilbao (Spain), March 17th.
42. **2014: “Geometric entanglement in topologically ordered states: theory and numerics”**, Institut de Ciències Fotoniques (ICFO), Barcelona (Spain), February 28th.
43. **2014: “Geometric entanglement in topologically ordered states: theory and numerics”**, Universitat Autònoma de Barcelona (Spain), February 26th.
44. **2014: “Geometric entanglement in topologically ordered states: theory and numerics”**, Universitat de Barcelona (Spain), February 24th.
45. **2012: “Entanglement and tensor networks to understand quantum many-body systems”**, Mathematics Department, Royal Holloway University of London (England), September 3rd.
46. **2012: “Robustness of 2d topological order and cluster states using classical simulations with infinite Projected Entangled Pair States”**, LMU München (Germany), June 29th.
47. **2012: “Studying the robustness of topological phases with infinite-PEPS and pCUT methods”**, Universitat Autònoma de Barcelona (UAB), Barcelona (Spain), May 21st.

48. **2012: “Entanglement and tensor networks to understand quantum many-body systems”**, École Polytechnique Fédérale de Lausanne (EPFL) (Switzerland), March 15th.
49. **2012: “Entanglement and tensor networks to understand quantum many-body systems”**, Johannes Gutenberg Universität Mainz (Germany), March 8th.
50. **2011: “Introduction to Tensor Networks”**, Universität Würzburg (Germany), October 19th.
51. **2011: “Robustness of a topological phase”**, Theoretical Nanophysics Group at LMU München (Germany), May 18th.
52. **2011: “Introduction to tensor network algorithms”**, TU Dortmund (Germany), February 4th.
53. **2011: “Infinite projected entangled pair states: properties and applications”**, TU Dortmund (Germany), February 2nd.
54. **2010: “Simulation of infinite-size 2D quantum lattice systems: corner transfer matrices and fermionic systems”**, Doppler Institute, Prague (Czech Republic), February 9th.
55. **2009: “Simulation of infinite-size 2D quantum lattice systems: corner transfer matrices and fermionic systems”**, Institut de Ciències Fotoniques (ICFO), Barcelona (Spain), December 18th.
56. **2009: “Quantum many-body systems and tensor networks: simulation methods and applications”**, Department of Physics and Astronomy, University of Southern California, Los Angeles (USA), January 19th.
57. **2009: “Quantum many-body systems and tensor networks: simulation methods and applications”**, Condensed matter department, Boston University, Boston (USA), January 15th.
58. **2009: “Quantum many-body systems and tensor networks: simulation methods and applications”**, Max Planck Institut Für Quantenoptik, Garching (Germany), January 8th.
59. **2008: “Quantum many-body systems and tensor networks: simulation methods and applications”**, talk given at the Perimeter Institute for Theoretical Physics, Waterloo (Canada), October 8th.
60. **2008: “Entanglement and the simulation of 2D systems”**, Institute of Quantum Optics and Quantum Information (IQOQI), University of Innsbruck, Innsbruck (Austria), January 11th.
61. **2006: “Entanglement loss properties and classical simulability of quantum many-body systems”**, talk given at the Quantum Information Group, University of Queensland, Brisbane (Australia), March 9th.
62. **2006: “Basics on Renormalization and Conformal Field Theory”**, Quantum Information Group, University of Queensland, Brisbane (Australia), March 2nd and 7th.
63. **2006: “Entanglement loss properties and classical simulability of quantum many-body systems”**, IBM Watson Research Center, Yorktown (U.S.), February 21th.
64. **2006: “Entanglement loss properties and classical simulability of quantum many-body systems”**, Institute for Quantum Computing, University of Waterloo, Waterloo (Canada), February 13th.
65. **2006: “Entanglement loss properties and classical simulability of quantum many-body systems”**, Perimeter Institute for Theoretical Physics, Waterloo (Canada), February 6th.
66. **2005: “An introduction to (quantum) complexity theory”**, Max Planck Institut Für Quantenoptik, Garching (Germany), May 4th.

7.3 Contributed at conferences/workshops/meetings

1. **2019: “Multiverse Computing”**, I Congreso de Emprendimiento UPV/EHU, San Sebastián (Spain), November 28th.
2. **2019: “Quantum computing meets finance”**, 3rd Basque Quantum Science and Technology Workshop, NanoGune, San Sebastián (Spain), May 23rd.
3. **2019: “Phase diagram of the Ruby model with infinite-PEPS”**, Anyons in Quantum Many-Body Systems, MPI PKS Dresden (Germany), January 24th.
4. **2018: “A simple tensor network algorithm for 2d steady states”**, DPG Spring Meeting 2018 of the Condensed Matter Section, at TU Berlin (Germany), March 13th.
5. **2017: “2d iPEPS: recent progress and perspectives for the simulation of (2+1)d LGT”**, Quantum methods for lattice gauge theories calculations, MITP, Mainz (Germany), February 9th.

6. **2015: “Entanglement, tensor networks, and topological quantum order”**, Korrelationstage 2015, MPI PKS Dresden (Germany), September 30th.
7. **2015: “The Heisenberg Model on the Kagome Lattice”**, Group Workshop at Oberwesel (Germany), April 16th (substituting Marc Ziegler).
8. **2015: “Entanglement and Tensor Networks in quantum Many-Body Systems”**, Group Workshop at Oberwesel (Germany), April 14th.
9. **2015: “Towards a complete characterization of 2d topological order using tensor networks and multipartite entanglement”**, DPG Spring Meeting 2015 of the Condensed Matter Section, at TU Berlin (Germany), March 19th.
10. **2013: “2d topological order: robustness and multipartite entanglement”**, Benasque symposium on topological quantum information at Centro de Ciencias de Benasque Pedro Pascual, Benasque (Spain), February 15th.
11. **2013: “Robustness of 2d topological order and cluster states using infinite Projected Entangled Pair States”**, Mini-Workshop on Recent Developments in DMRG and TNS at National Taiwan University, Taipei (Taiwan), December 10th.
12. **2012: “Robustness of 2d topological order and cluster states using infinite Projected Entangled Pair States methods”**, Workshop on Quantum Simulations at Universidad del Pais Vasco, Bilbao (Spain), October 24th.
13. **2012: “Studying the robustness of topological phases with infinite-PEPS and pCUT methods”**, DMRG Gathering 2012 at Erwin Schrödinger Institut for Mathematical Physics (ESI), Vienna (Austria), May 4th.
14. **2012: “Studying the robustness of topological phases with infinite-PEPS and pCUT methods”**, Interdisciplinary Workshop on Topological States of Matter at Universität Freiburg, Freiburg (Germany), March 21st.
15. **2011: “Studying the robustness of topological phases with infinite-PEPS and pCUT methods”**, International Conference on Quantum Information Processing and Communication (QIPC) 2011 at ETH, Zurich (Switzerland), September 8th.
16. **2011: “Classical Simulations of Many-Body Systems with Infinite Projected Entangled Pair States”**, Workshop on Quantum Simulation at Centro de Ciencias de Benasque Pedro Pascual, Benasque (Spain), March 4th.
17. **2010: “Simulating two-dimensional quantum systems on an infinite lattice using Projected Entangled Pair States and Corner Transfer Matrices”**, XXIV IUPAP International Conference on Statistical Physics (Statphys 24) at Convention Centre, Cairns (Australia), July 23rd.
18. **2009: “Recent developments on the simulation of 2D quantum many-body systems with infinite projected entangled pair states”**, 2009 Annual Statistical Mechanics Meeting at Mathematical Sciences Institute, The Australian National University, Canberra (Australia), December 1st.
19. **2008: “Entanglement and the simulation of 2D systems”**, Tensor network methods and entanglement in quantum many-body systems at Erwin Schrödinger Institut for Mathematical Physics (ESI), Vienna (Austria), January 17th.
20. **2005: “Large-N entanglement-handled simulation of a quantum computer using PEPS”**, Informal Quantum Information Gathering (IQING) 2005 at Ecole Normale Supérieure, Paris (France), July 23rd.

7.4 Departmental

1. **2016: “What the hell is spin? (Or: unitary representations of the Poincaré group)**, KOMET337 group meeting, Institut für Physik, Johannes Gutenberg Universität Mainz (Germany), June 3rd.
2. **2015: “Matter from entangled qubits: progress and perspectives in tensor networks”**, Theoriekolloquium, Institut für Physik, Johannes Gutenberg Universität Mainz (Germany), December 17th.
3. **2015: “A non-technical introduction to Conformal Field Theory”**, KOMET337 group meeting, Institut für Physik, Johannes Gutenberg Universität Mainz (Germany), December 1st.
4. **2013: “Entanglement and Tensor Networks to Understand Quantum Many-Body Systems”**, Institutstreff at Institut für Physik, Johannes Gutenberg Universität Mainz (Germany), July 4th.

5. **2012: “Robustness of 2d topological order and cluster states using infinite Projected Entangled Pair States methods”**, MPQ Theory Group Workshop at Friedrichshafen (Germany), September 15th.
6. **2012: “Continuous Unitary Transformations for Quantum Many-Body Systems”**, Max Planck Institut Für Quantenoptik, Garching (Germany), February 1st.
7. **2011: “Studying the robustness of topological phases with infinite-PEPS and pCUT methods”**, Max Planck Institut Für Quantenoptik, Garching (Germany), September 28th.
8. **2011: “Entanglement in Many-body systems”**, MPQ Theory Group Workshop, at Zum Gourmet Wellness Hotel, Seefeld (Austria), May 27th.
9. **2011: “Introduction to MERA”**, Max Planck Institut Für Quantenoptik, Garching (Germany), April 7th.
10. **2011: “Introduction to tensor network algorithms”**, Max Planck Institut Für Quantenoptik, Garching (Germany), February 10th.
11. **2009: “Recent developments on the simulation of 2D quantum many-body systems with infinite projected entangled pair states”**, Quantum Simulation Group, University of Queensland, Brisbane (Australia), November 27th.
12. **2009: “The corner transfer matrix revisited”**, Quantum Simulation Group, University of Queensland, Brisbane (Australia), May 24th and July 2nd.
13. **2009: “First order phase transition in the anisotropic quantum orbital compass model”**, Quantum Simulation Group, University of Queensland, Brisbane (Australia), November 6th.
14. **2008: “Simulation of quantum many-body systems with tensor network methods”**, Physics Colloquium, University of Queensland, Brisbane (Australia), June 20th.
15. **2007: “Entanglement and the simulation of 2D quantum systems”**, School of Physical Sciences, University of Queensland, Brisbane (Australia), October 30th.
16. **2007: “Tensor networks and the numerical study of quantum and classical systems on infinite lattices”**, Quantum Information Group, University of Queensland, Brisbane (Australia), February 16th.
17. **2006: “Entanglement, quantum phase transitions and quantum algorithms”**, PhD thesis talk, University of Barcelona (Spain), July 20th.
18. **2004: “Entropia de forats negres i correlacions quàntiques, & robustesa de correlacions quàntiques febles a sistemes de tres qubits”**, DEA talk, University of Barcelona (Spain), June 30th.
19. **2003: “News on Quantum Algorithms”**, University of Barcelona (Spain), March 10th.
20. **2002: “Majorization analysis of the quantum Fourier transformation in phase-estimation algorithms”**, University of Barcelona (Spain), May 15th.

8 Posters

1. **2019: “Phase diagrams of the three-dimensional Kitaev-Heisenberg models with tensor networks”**, Anyons in Quantum Many-Body Systems, MPI PKS Dresden (Germany), January 21st-25th.
2. **2017: “A simple tensor network algorithm for 2d steady states”**, BEC2017, Sant Feliu (Spain), September 2nd – 8th.
3. **2014: “Geometric entanglement in topologically ordered states: theory and numerics”**, Topological Matter Out of Equilibrium, at Max-Planck Institut of Complex Systems, Dresden (Germany), March 27th-29th.
4. **2014: “Geometric entanglement in topologically ordered states: theory and numerics”**, Entanglement detection and quantification, at Bilbao (Spain), March 10th-13th.
5. **2012: “Robustness of 2d cluster states”**, Entanglement Spectra in Complex Quantum Wavefunctions, at Max-Planck Institut of Complex Systems, Dresden (Germany), November 12th-16th.
6. **2012: “Studying the robustness of topological phases with infinite-PEPS and pCUT methods”**, Quantum Information meets Statistical Mechanics 2012 at University of Innsbruck (Austria), September 21st-24th.
7. **2011: “Studying the robustness of topological phases with infinite-PEPS and pCUT methods”**, Workshop on Synergies between Field Theory and Exact Computational Methods in Strongly Correlated Quantum Matter at Trieste (Italy), July 24th-29th.

8. **2010: “Simulating two-dimensional quantum systems on an infinite lattice using Projected Entangled Pair States and Corner Transfer Matrices”**, MPQ-ICFO Workshop 2010 at St. Benet (Spain), December 14th-17th.
9. **2010: “Entanglement in many-body systems and infinite PEPS: recent developments and perspectives”**, 13th Workshop on Quantum Information Processing (QIP) 2010 at ETH, Zurich (Switzerland), January 15th-22nd.
10. **2009: “Simulation of infinite 2D lattice systems with TPS/PEPS”**, Quantum Frontiers Symposium 2009 at University of Queensland, Brisbane (Australia), April 2nd-3rd.
11. **2008: “Universal Geometric Entanglement Close to Quantum Phase Transitions”**, 4th Asia-Pacific Conference in Quantum Information Science (APCQIS) 2008, at the Novotel Palm Cove Resort, Cairns (Australia), July 2nd-5th.
12. **2007: “Classical simulation of mixed-state evolution under completely-positive maps”**, The Tenth Workshop on Quantum Information Processing (QIP) 2007 at Queensland Conservatorium, Brisbane (Australia), January 30th - February 3rd.
13. **2007: “Simulation of infinite 2-dimensional systems with PEPS”**, The Tenth Workshop on Quantum Information Processing (QIP) 2007 at Queensland Conservatorium, Brisbane (Australia), January 30th - February 3rd.
14. **2004: “Universality of Entanglement and Quantum Computation Complexity”**, Quantum Entanglement in Physical and Information Sciences at Scuola Normale Superiore, Pisa (Italy), December 14th-18th.
15. **2004: “Universality of Entanglement and Quantum Computation Complexity”**, Entanglement, Information and Noise, at Krzyzowa Foundation for Mutual Understanding in Europe, Krzyzowa (Poland), June 14th-20th.
16. **2004: “Universality of Entanglement and Quantum Computation Complexity”**, 2004 Latsis Symposium on Quantum Communication and Computing at EPFL, Lausanne (Switzerland), March 1st-3rd.
17. **2003: “Systematic Analysis of Majorization in Quantum Algorithms”**, Quantum Entanglement and Information Processing at Ecole de Physique, Les Houches (France), June 30th - July 25th.
18. **2003: “Systematic Analysis of Majorization in Quantum Algorithms”**, Advances in Quantum Information Processing: from Theory to Experiments at Ettore Majorana Center, Erice (Italy), March 15th-22nd.

9 Organized events

1. **2020:** Entanglement in strongly correlated systems; Centro de Ciencias de Benasque Pedro Pascual, Benasque (Spain), February 9th - 22th. Scientific organizer, together with Didier Poilblanc, Norbert Schuch and Frédéric Mila.
benasque.org/2020scs/
2. **2019:** Tensor Networks for Quantum Many-Body Systems (TENSOR19); DIPC/CFM, San Sebastián (Spain), November 25th - 29th. Scientific organizer, together with Frank Pollmann, Norbert Schuch and Frank Verstraete.
<http://tensor2019.dipc.org/>
3. **2019:** La ciència del llenguatge: projectes interdisciplinaris i la seva aplicació a l'aula de secundària; UPF, Barcelona, Spain, June 25th – 28th. Organizer together with Ángel Gállego.
www.fundaciorecerca.cat/ca/escoles-d-estiu-2019
4. **2019:** LatorreFest (in honor of the 60th birthday of J. I. Latorre); Col·legi Major Sant Jordi, Barcelona (Spain), May 31st. Scientific organizer, together with Juan Rojo and Antonio Acín.
<http://latorrefest60.icfo.eu/>
5. **2019:** 3rd Basque Quantum Science and Technology Workshop; NanoGune, San Sebastián (Spain), May 23rd. Scientific organizer, together with Geza Giedke, Dario Bercioux, Enrique Rico, Adolfo del Campo, Lucas Lamata, and Enrique Solano.
<http://dipc.ehu.es/giedke/eusqutech19.html>
6. **2019:** DIPC Symposium on Quantum Science; Donostia International Physics Center, San Sebastian (Spain), March 26th. Scientific organizer.
http://dipc.ehu.es/ws_presentacion.php?id=204

7. **2019:** Entanglement in strongly correlated systems; Centro de Ciencias de Benasque Pedro Pascual, Benasque (Spain), February 24th - March 9th. Scientific organizer, together with Didier Poilblanc and Norbert Schuch.
benasque.org/2019scs/
8. **2018:** Entanglement in strongly correlated systems; Centro de Ciencias de Benasque Pedro Pascual, Benasque (Spain), February 18th - March 5th. Scientific organizer, together with Didier Poilblanc and Norbert Schuch.
benasque.org/2018scs/
9. **2017:** Tensor network methods: structure, applications and holography; Simons Center for Geometry and Physics, Stony Brook (USA), December 11th - 15th, together with Tzu-Chieh Wei, David Perez-García and Glen Evenbly.
scgp.stonybrook.edu/archives/21143
10. **2017:** Entanglement in strongly correlated systems; Centro de Ciencias de Benasque Pedro Pascual, Benasque (Spain), February 5th - February 18th. Scientific organizer, together with Didier Poilblanc and Nicolas Regnault.
benasque.org/2017scs/
11. **2016:** Entanglement in strongly correlated systems; Centro de Ciencias de Benasque Pedro Pascual, Benasque (Spain), February 14th - February 27th. Scientific organizer, together with Didier Poilblanc and Julien Vidal.
benasque.org/2016scs/
12. **2015:** Mainz Group Workshop (Vier Quanten); Oberwesel (Germany), April 13th - 17th. Scientific organizer, together with Matteo Rizzi, Peter van Lock, and Patrick Windpassinger.
13. **2014:** Analytical and numerical approaches to strongly correlated systems; Centro de Ciencias de Benasque Pedro Pascual, Benasque (Spain), August 25th - September 12th. Scientific organizer, together with Didier Poilblanc and Julien Vidal.
benasque.org/2014numerical/
14. **2013:** Perspectives on Quantum Many-Body Entanglement; Johannes Gutenberg-Universität, Mainz (Germany), September 25th-27th. Scientific organizer, together with Matteo Rizzi.
sites.google.com/site/pqmbe2013/home
15. **2012:** Networking tensor networks: many-body systems and simulations (TN2012), Centro de Ciencias de Benasque Pedro Pascual, Benasque (Spain), May 7th-19th. Scientific organizer, together with Mari Carmen Bañuls and David Perez-Garcia.
benasque.org/2012network/

10 Attended events

10.1 Academic conferences/workshops/meetings

1. **2020:** Le Lab Quantique, online webinar meeting, April 28th.
2. **2020:** Entanglement in strongly correlated systems; Centro de Ciencias de Benasque Pedro Pascual, Benasque (Spain), February 9th - 22th.
3. **2019:** DIPC-MIPT Workshop, San Sebastián (Spain), November 6th - 7th.
4. **2019:** LatorreFest (in honor of the 60th birthday of J. I. Latorre); Barcelona (Spain), May 31st.
5. **2019:** ICE-5, 5th Conference on quantum information in Spain; Barcelona (Spain), May 28th - 30th.
6. **2019:** 3rd Basque Quantum Science and Technology Workshop; NanoGune, San Sebastián (Spain), May 23rd.
7. **2019:** Nuevas aplicaciones de la revolución cuántica; Enginyers Industrials de Catalunya, Barcelona (Spain), May 14th.
8. **2019:** DIPC Symposium on Quantum Science; Donostia International Physics Center, San Sebastian (Spain), March 26th.
9. **2019:** The Mathematics of Quantum Information; University of Siegen, Siegen (Germany), March 18th - 21st.
10. **2019:** Entanglement in strongly correlated systems; Centro de Ciencias de Benasque Pedro Pascual, Benasque (Spain), February 24th - March 9th.
11. **2019:** Quantum MWC19, Mobile World Congress 2019, Barcelona (Spain), February 28th.

12. **2019:** Engineering Quantum Open Systems, UPV (Bilbao), February 12th.
13. **2019:** Anyons in Quantum Many-Body Systems, MPI PKS Dresden (Germany), January 21st-25th.
14. **2018:** Quantum Computing Germany v1.0, Frankfurt (Germany), December 14th.
15. **2018:** Tensor Network States, Algorithms and Applications, RIKEN Advanced Institute for Computational Science, Kobe (Japan), December 3rd - 6th.
16. **2018:** International symposium on Quantum Technologies, Fundación Ramón Acero, Madrid (Spain), November 21st-22nd.
17. **2018:** Tensor Networks and Entanglement, Galileo Galilei Institute (Florence), June 18th-22nd.
18. **2018:** DPG Spring Meeting 2018 of the Condensed Matter Section, at TU Berlin (Germany), March 11th-16th.
19. **2018:** Entanglement in strongly correlated systems; Centro de Ciencias de Benasque Pedro Pascual, Benasque (Spain), February 19th - March 2nd.
20. **2017:** Tensor network methods: structure, applications and holography; Simons Center for Geometry and Physics, Stony Brook (USA), December 11th - 15th.
21. **2017:** Tensor Networks from Simulation to Holography, DESY (Hamburg), October 4th - 6th.
22. **2017:** Progress in Diagrammatic Monte Carlo Methods for Quantum Field Theories in Particle-, Nuclear-, and Condensed Matter Physics, MITP (Mainz), September 11th - 22nd.
23. **2017:** Korrelationstage 2017 (Dresden), September 11th - 15th.
24. **2017:** BEC2017, Sant Feliu (Spain), September 2nd - 8th.
25. **2017:** Generative Syntax: Questions, Crossroads and Challenges, UAB (Spain), June 21st-23rd.
26. **2017:** From Static to Dynamical Gauge Fields with Ultracold Atoms, Galileo Galilei Institute (Florence), June 4th-9th.
27. **2017:** Entanglement in strongly correlated systems; Centro de Ciencias de Benasque Pedro Pascual, Benasque (Spain), February 5th - 18th.
28. **2017:** Quantum methods for lattice gauge theories calculations, MITP, Mainz (Germany), February 6th - 10th.
29. **2017:** Numerical methods for quantum optics 2017, CSIC, Madrid (Spain), January 26th - 27th.
30. **2017:** Elements of Matrix Syntax, Centre de Lingüística Teòrica at Universitat Autònoma de Barcelona (Spain), January 9th - 11th.
31. **2016:** Quantum Many-Body Methods in Condensed Matter Systems, RWTH Aachen University (Germany), October 4th - 7th.
32. **2016:** Synergies between Mathematical and Computational Approaches to Quantum Many-Body Physics, ESI, Vienna (Austria), August 29 - October 21.
33. **2016:** Recent progress in low-dimensional quantum magnetism (LDQM2016), EPFL, Lausanne (Switzerland), September 5th - 16th.
34. **2016:** International Workshop on Tensor Networks and Quantum Many-Body Problems (TNQMP2016); ISSP, Kashiwa (Japan), June 27th - July 15th.
35. **2016:** Emergent properties of space-time; CERN, Geneva (Switzerland), June 20th - July 1st.
36. **2016:** Entanglement in strongly correlated systems; Centro de Ciencias de Benasque Pedro Pascual, Benasque (Spain), February 14th - 27th.
37. **2015:** Korrelationstage, MPI PKS Dresden (German), September 28th - October 2nd
38. **2015:** Topological Phases in Condensed Matter and Cold Atom Systems, Institut d'Études Scientifiques de Cargèse (France), August 31st - September 12th
39. **2015:** Workshop and Symposium on DMRG Technique for Strongly Correlated Systems in Physics and Chemistry, at Natal (Brazil), June 22nd-27th
40. **2015:** Mainz KOMET Miniworkshop, Johannes Gutenberg-Universität (Germany), April 23rd

41. **2015:** Mainz Group Workshop, Oberwesel (Germany), April 13th - 17th
42. **2015:** DPG Spring Meeting of the Condensed Matter Section, TU Berlin (Germany), March 15th - 20th
43. **2015:** International Workshop on New Frontier Numerical Methods for Many-Body Correlations - Methodologies and Algorithms for Fermion Many-Body Problems, at the University of Tokyo (Japan), February 18th-21st.
44. **2015:** Holographic Renormalization Group and Entanglement, at the APC Paris, January 26th-28th.
45. **2014:** Tensor Network States: Algorithms and Applications, at the Institute of Physics, Chinese Academy of Sciences (China), December 1st-5th.
46. **2014:** SRFN Workshop, Ebernbug (Germany), October 16th-17th.
47. **2014:** Analytical and numerical approaches to strongly correlated systems, Centro de Ciencias de Benasque Pedro Pascual, Benasque (Spain), August 25th - September 12th.
48. **2014:** Mainz-Marburg Miniworkshop, at the Johannes Gutenberg-Universität (Germany), May 21st.
49. **2014:** DPG Spring Meeting of the Condensed Matter Section, TU Dresden (Germany), March 30th - April 4.
50. **2014:** Topological Matter Out of Equilibrium, Max-Planck Institut of Complex Systems, Dresden (Germany), March 27th-29th.
51. **2014:** Entanglement detection and quantification, Bilbao (Spain), March 10th-13th.
52. **2013:** 5th R-ION Meeting, Johannes Gutenberg Universität Mainz (Germany), November 12th.
53. **2013:** CMSI International Workshop 2013: Recent Progress in Tensor Network Algorithms, RIKEN Advanced Institute for Computational Science, Kobe (Japan), October 16th-18th.
54. **2013:** Perspectives on Quantum Many-Body Entanglement, Johannes-Gutenberg-Universität, Mainz (Germany), September 25th-27th.
55. **2013:** Statistical Physics of Quantum Matter, National Taiwan University, Taipei (Taiwan), July 28th-31st.
56. **2013:** Mainz-Marburg Miniworkshop, at the Universität Marburg (Germany), July 11th.
57. **2013:** Tensor network algorithms in computational physics and numerical analysis, ETH, Zurich (Switzerland), May 15th-17th.
58. **2013:** Benasque symposium on topological quantum information, Centro de Ciencias de Benasque Pedro Pascual (CCBPP), Benasque (Spain), February 13th-15th.
59. **2012:** Mini-Workshop on Recent Developments on DMRG and TNS, National Taiwan University, Taipei (Taiwan), December 10th.
60. **2012:** Entanglement Spectra in Complex Quantum Wavefunctions, Max-Planck Institut of Complex Systems, Dresden (Germany), November 12th-16th.
61. **2012:** Workshop on Quantum Simulations, Universidad del Pais Vasco, Bilbao (Spain), October 22th-25th.
62. **2012:** Quantum Information meets Statistical Mechanics 2012, University of Innsbruck (Austria), September 21st-24th.
63. **2012:** ICE-0 Workshop de Información Cuántica en España, CSIC, Madrid (Spain), September 17th-19th.
64. **2012:** MPQ Theory Group Workshop, at Friedrichshafen (Germany), September 12th-15th.
65. **2012:** Networking Tensor Networks: Many-Body Systems and Simulations, Centro de Ciencias de Benasque Pedro Pascual (CCBPP), Benasque (Spain), May 7th-19th.
66. **2012:** DMRG Gathering 2012, Erwin Schrödinger Institut for Mathematical Physics (ESI), Vienna (Austria), May 4th.
67. **2012:** Interdisciplinary Workshop on Topological States of Matter, Universität Freiburg, Freiburg (Germany), March 18th-22nd.
68. **2011:** International Conference on Quantum Information Processing and Communication (QIPC) 2011, ETH, Zurich (Switzerland), September 5th-9th.
69. **2011:** Workshop on Synergies between Field Theory and Exact Computational Methods in Strongly Correlated Quantum Matter, Trieste (Italy), July 24th-29th.

70. **2011:** Quantum Information, Benasque Center for Science, Benasque (Spain), June 12th - July 1st.
71. **2011:** MPQ Theory Group Workshop, Zum Gourmet Wellness Hotel, Seefeld (Austria), May 25th-May 28th.
72. **2011:** Quantum Simulations, Centro de Ciencias de Benasque Pedro Pascual, Benasque (Spain), February 28th -March 5th.
73. **2010:** MPQ-ICFO Workshop, St. Benet (Spain), December 14th-17th.
74. **2010:** XXIV IUPAP International Conference on Statistical Physics, Convention Centre, Cairns (Australia), July 19th-23rd.
75. **2010:** Exactly Solvable Models in Statistical Physics, Centre for Mathematical Physics, University of Queensland, Brisbane (Australia), July 14th-17th.
76. **2010:** Combinatorics and Mathematical Physics, Centre for Mathematical Physics, University of Queensland, Brisbane (Australia), July 12th-14th.
77. **2010:** Tensor Network Workshop 2010, Max Planck Institut Für Quantenoptik, Garching (Germany), January 27th-30th.
78. **2010:** 13th Workshop on Quantum Information Processing (QIP) 2010, ETH, Zurich (Switzerland), January 15th-22nd.
79. **2009:** 9a Trobada de Nadal de Física Teòrica, University of Barcelona (Spain), December 21st-22nd.
80. **2009:** 2009 Annual Statistical Mechanics Meeting, Mathematical Sciences Institute, The Australian National University, Canberra (Australia), November 30th - December 1st.
81. **2009:** Quantum Frontiers Symposium 2009, University of Queensland, Brisbane (Australia), April 2nd-3rd 2009.
82. **2009:** Numerical Approaches to Quantum Many-body Systems, Institute for Pure and Applied Mathematics (IPAM), University of California Los Angeles (UCLA), Los Angeles (USA), January 26th-30th.
83. **2008:** Theoretical aspects of tensor network states, Universidad Complutense, Madrid (Spain), October 15th-18th.
84. **2008:** 4th Asia-Pacific Conference in Quantum Information Science (APCQIS) 2008, Novotel Palm Cove Resort, Cairns (Australia), July 2nd-5th.
85. **2008:** Quantum Information and Control in Queensland (QICIQ) 2008, Novotel Palm Cove Resort, Cairns (Australia), June 30th - July 3rd.
86. **2008:** Tensor network methods and entanglement in quantum many-body systems, Erwin Schrödinger Institut für Mathematical Physics (ESI), Vienna (Austria), January 16th-19th.
87. **2008:** Workshop on Simulation, University of Barcelona (Spain), January 3rd.
88. **2007:** 7a Trobada de Nadal de Física Teòrica, University of Barcelona (Spain), December 19th-20th.
89. **2007:** Relativistic Quantum Information Workshop, Customs House, The University of Queensland, Brisbane (Australia), November 15th-16th.
90. **2007:** The Tenth Workshop on Quantum Information Processing (QIP) 2007, Queensland Conservatorium, Brisbane (Australia), January 30th - February 3rd.
91. **2006:** 6a Trobada de Nadal de Física Teòrica, University of Barcelona (Spain), December 19th-21st.
92. **2006:** Mathematical Aspects of Quantum Adiabatic Approximation Workshop, Perimeter Institute for Theoretical Physics, Waterloo (Canada), February 9th-11th.
93. **2006:** The Ninth Workshop on Quantum Information Processing (QIP) 2006, Carré des Sciences, Paris (France), January 16th-20th.
94. **2005:** Informal Quantum Information Gathering (IQING) 2005, Ecole Normale Supérieure, Paris (France), July 23rd-25th.
95. **2005:** Quantum Information, Benasque Center for Science, Benasque (Spain), June 12th - July 1st.
96. **2005:** MPQ Theory Group Workshop, Ringberg's castle (Germany), April 4th-8th.
97. **2004:** Quantum Entanglement in Physical and Information Sciences, Scuola Normale Superiore, Pisa (Italy), December 14th-18th.

98. **2004:** Quantum Information Theory: Present Status and Future Directions, Isaac Newton Institute, University of Cambridge, Cambridge (U.K.), August 23rd-27th.
99. **2004:** Entanglement, Information and Noise, Krzyzowa Foundation for Mutual Understanding in Europe, Krzyzowa (Poland), June 14th-20th.
100. **2004:** 2004 Latsis Symposium on Quantum Communication and Computing, EPFL, Lausanne (Switzerland), March 1st-3rd.
101. **2004:** 3rd RESQ workshop, ICFO and University of Barcelona, Barcelona (Spain), January 8th-10th.
102. **2003:** Quantum Information and Communication, Benasque Center for Science, Benasque (Spain), June 22nd - July 11th.
103. **2003:** Advances in Quantum Information Processing: from Theory to Experiments, Ettore Majorana Center, Erice (Italy), March 15th-22nd.
104. **2002:** International Conference on Quantum Information: Conceptual Foundations, Developements and Perspectives, Oviedo (Spain), July 13th-18th.

10.2 Academic schools

1. **2019:** Tensor Networks for Quantum Many-Body Systems (TENSOR19); DIPC/CFM, San Sebastián (Spain), November 25th – 29th.
2. **2019** Frontiers of Condensed Matter 2019, École de Physique des Houches, Les Houches (France), September 16th – 27th.
3. **2019:** La ciència del llenguatge: projectes interdisciplinaris i la seva aplicació a l'aula de secundària, UPF (Barcelona, Spain), June 25th – 28th.
4. **2019:** Summer School on Quantum Technologies, Universidad Internacional Menéndez Pelayo, Santander (Spain), June 17th – 21st.
5. **2017:** European Tensor Network School, Univ. Ghent (Ghent, Belgium), November 6th – 10th.
6. **2017:** APCTP School on Entanglement and Quantum Phase Transition, Postech (Pohang, South Korea), 30th October – 4th November.
7. **2017:** Frontiers of Condensed Matter 2017, École de Physique des Houches, Les Houches (France), September 18th–29th.
8. **2014:** 4th Les Houches School in Computation Physics: From quantum gases to strongly correlated systems, École de Physique des Houches, Les Houches (France), June 23rd - July 4th.
9. **2014:** School on computational methods in quantum materials at Jouvence (Canada), May 26th - June 6th.
10. **2012:** DMRG101 Winter School, National Taiwan University, Taipei (Taiwan), December 7th-9th.
11. **2009:** Numerical Approaches to Quantum Many-body Systems, Institute for Pure and Applied Mathematics (IPAM), University of California Los Angeles (UCLA), Los Angeles (USA), January 22nd-25th.
12. **2007:** Lie Theory course of the ICE-EM Australian Graduate School in Mathematics, The University of Queensland, Brisbane (Australia), July 2nd-20th.
13. **2003:** Quantum Entanglement and Information Processing, École de Physique, Les Houches (France), June 30th - July 25th.
14. **2002:** International School on Quantum Computation and Information, Instituto Superior Tecnico, Lisbon (Portugal), September 2nd-7th.
15. **2002:** I Taller de Altas Energias, Peñíscola (Spain), April 1st-12th.

10.3 Academic career development

1. **2015:** Die W-Besoldung – Verhandlungsstrategien, Chancen und Risiken; Deutscher Hochschulverband (DHV), Universität Mannheim (Germany), September 21st.
2. **2015:** Auf dem Weg zur Professur – Gespräch mit dem President; Johannes Gutenberg-Universität, Mainz (Germany), June 15th.
3. **2013:** Begrüßung neue Professorinnen und Professoren; Johannes Gutenberg-Universität, Mainz (Germany), November 12th.
4. **2012:** Regional Workshop: ERC Starting and Consolidator Grants; Max-Planck- Institut für Extraterrestrische Physik, Garching (Germany), October 8th.
5. **2012:** Regional Workshop for 2012 Marie Curie Fellowship proposers: Finishing touch for your proposal; Max-Planck- Institut für Extraterrestrische Physik, Garching, (Germany), August 2nd.
6. **2009:** Honours Supervision; The University of Queensland (Australia), February 11th.

10.4 Business (all)

1. **2020:** DayOne Innovation Summit Vitoria, Vitoria (Spain), February 6th.
2. **2019:** I Congreso de Emprendimiento UPV/EHU, San Sebastián (Spain), November 28th.
3. **2019:** Retina LTD - El País, Madrid (Spain), October 29th.
4. **2019:** South Summit, Madrid (Spain), October 3rd.
5. **2019:** machineByte Europe 2019, Paris (France), September 17th – 18th.
6. **2019:** 33º Encuentro de la Economía Digital y las Telecomunicaciones (Ametic), Universidad Internacional Menéndez Pelayo, Santander (Spain), September 2nd – 4th.
7. **2019 - 2020:** Creative Destruction Lab Bootcamp and Acceleration Program on Quantum Machine Learning, Toronto (Canada), June 2019 - September 2020.
8. **2019:** DayOne Innovation Summit San Sebastian, San Sebastian (Spain), April 8th.
9. **2019:** Pack Inicio para Emprendedores, Fomento San Sebastián (Spain), January 28th - February 1st.
10. **2008:** Intellectual property and commercialisation; UniQuest at Twin Waters Resort, Sunshine Coast (Australia), May 1st-2nd.
11. **2008:** Intellectual property and commercialisation; University of Queensland, Brisbane (Australia), March 31st.

11 Research visits

1. **2019:** Instituto Tecnológico y de Energías Renovables (Spain), September 20th.
2. **2019:** IFT, CSIC (Spain), May 27th.
3. **2019:** Barcelona Supercomputing Center (Spain), April 3rd - 4th.
4. **2019:** UB (Spain), February 18th.
5. **2018:** Departamento de física teórica I, Universidad Complutense, Madrid (Spain), November 23rd.
6. **2018:** Departamento de análisis matemático, Universidad Complutense, Madrid (Spain), November 20th.
7. **2018:** IFT, CSIC (Spain), November 19th.
8. **2018:** UAB (Spain), October 30th.
9. **2018:** Donostia International Physics Center (Spain), May 1st - 31st.
10. **2018:** University of The Basque Country (Spain), January 8th – 9th.
11. **2017:** University of Greifswald (Germany), December 18th.
12. **2017:** Max Planck Institute for Gravitational Physics (Albert Einstein Institute), Potsdam (Germany), November 24th.

13. **2017:** University of Braunschweig (Germany), November 21st.
14. **2017:** UB (Spain), November 13th – 14th.
15. **2017:** ICFO (Spain), June 22nd.
16. **2017:** UAB (Spain), June 21st.
17. **2017:** Technion (Israel), May 15th - 21st.
18. **2017:** University of the Basque Country (Spain), March 14th.
19. **2017:** Donostia International Physics Center (Spain), March 5th - 31st.
20. **2017:** University of Göttingen (Germany), January 30th.
21. **2017:** University of Hannover (Germany), January 23rd-24th.
22. **2017:** Centre de Lingüística Teòrica, Universitat Autònoma de Barcelona (Spain), January 9th-11th.
23. **2016:** FAU, Erlangen (Germany), December 6th - 8th.
24. **2016:** University of Amsterdam (Netherlands), September 20th - 22nd.
25. **2016:** Max Planck Institute for the Physics of Complex Systems, Dresden (Germany), June 9th.
26. **2016:** Universität Stuttgart (Germany), April 21st
27. **2016:** Laboratoire de Physique Théorique, Université Paul Sabatier, Toulouse (France), March 7th- April 17th
28. **2016:** Centre de Lingüística Teòrica, Universitat Autònoma de Barcelona (Spain), January 11th-14th.
29. **2015:** University of Ghent (Belgium), October 21st-22nd.
30. **2015:** University of Princeton (USA), October 14th-16th.
31. **2015:** University of Stonybrook (USA), October 9th-13th.
32. **2015:** Freie Universität Berlin (Germany), July 16th-17th.
33. **2015:** University of Cologne (Germany), July 10th.
34. **2015:** Laboratoire de Physique Théorique, Université Paul Sabatier, Toulouse (France), March 2nd-6th
35. **2015:** Solid State Physics and Nanophysics Group, LMU, Munich (Germany), January 9th.
36. **2015:** Max Planck Institute of Quantum Optics, Theory Division, Garching (Germany), January 8th.
37. **2015:** FAU, Erlangen (Germany), January 7th.
38. **2014:** DESY Zeuthen (Germany), December 15th.
39. **2014:** FU Berlin, Department of Physics, Berlin (Germany), November 12th-14th.
40. **2014:** TU Dortmund, Theoretical Physics Department, Dortmund (Germany), October 21st-23rd.
41. **2014:** Quantum technologies and information science group, UPV, Bilbao (Spain), June 10th-13th.
42. **2014:** Quantum technologies and information science group, UPV, Bilbao (Spain), March 17th-18th.
43. **2014:** Quantum optics theory group, ICFO, Barcelona (Spain), February 28th.
44. **2014:** Quantum information group, Autonomous University of Barcelona, Barcelona (Spain), February 26th.
45. **2014:** Quantum information group, University of Barcelona, Barcelona (Spain), February 24th.
46. **2013:** Physics Department, National Taiwan University, Taipei (Taiwan), August 1st-2nd.
47. **2012:** Mathematics Department, Royal Holloway University of London, London (England), September 3rd-4th.
48. **2012:** Solid State Physics and Nanophysics Group, LMU, Munich (Germany), June 29th.
49. **2012:** Quantum Information Group, Universitat de Barcelona (UB), Barcelona (Spain), May 23rd.
50. **2012:** Quantum Information Group, Universitat Autònoma de Barcelona (UAB), Barcelona (Spain), May 21st.

51. **2012:** École Polytechnique Fédérale de Lausanne (EPFL), Institute for Theoretical Physics, Lausanne (Switzerland), March 12th-15th.
52. **2012:** Johannes Gutenberg Universität Mainz, Physics Department, Mainz (Germany), March 8th.
53. **2012:** TU Dortmund, Theoretical Physics Department, Dortmund (Germany), February 12th-16th.
54. **2011:** Laboratoire de Physique Théorique de la Matière Condensée, CNRS UMR 7600, Université Pierre et Marie Curie, Paris (France), May 2nd-5th.
55. **2011:** TU Dortmund, Theoretical Physics Department, Dortmund (Germany), January 31st - February 4th.
56. **2010:** Doppler Institute, Prague (Czech Republic), February 8th-9th.
57. **2010:** Quantum Information Group, University of Vienna, Vienna (Austria), February 1st-5th.
58. **2010:** ETH, Physics Department, Zurich (Switzerland), January 26th.
59. **2010:** Max Planck Institute of Quantum Optics, Theory Division, Garching (Germany), January 8th-16th.
60. **2009:** Department of Physics and Astronomy, University of Southern California, Los Angeles (USA), January 19th-21st.
61. **2009:** Condensed matter department, Boston University, Boston (USA), January 10th-17th.
62. **2009:** Max Planck Institute of Quantum Optics, Theory Division, Garching (Germany), January 5th-8th.
63. **2008:** Departamento de análisis matemático, Universidad Complutense, Madrid (Spain), October 13th-20th.
64. **2008:** Perimeter Institute for Theoretical Physics, Waterloo (Canada), October 3rd-11th.
65. **2008:** Quantum Information Group, University of Vienna, Vienna (Austria), January 14th-19th.
66. **2008:** Quantum Information Group, University of Innsbruck, Innsbruck (Austria), January 10th-13th.
67. **2008:** Max Planck Institute of Quantum Optics, Theory Division, Garching (Germany), January 7th-9th.
68. **2007:** Departament d'Estructura i Constituents de la Matèria, University of Barcelona (Spain), December 14th-23rd.
69. **2006:** Departament d'Estructura i Constituents de la Matèria, University of Barcelona (Spain), December 15th-23rd.
70. **2006:** Quantum Information Group, University of Queensland, Brisbane (Australia), February 26th - March 19th.
71. **2006:** IBM Watson Research Center, Yorktown (U.S.), February 19th-24th.
72. **2006:** Institute of Quantum Computing, University of Waterloo, Waterloo (Canada), February 12th-18th.
73. **2006:** Perimeter Institute for Theoretical Physics, Waterloo (Canada), February 4th-11th.
74. **2005:** Max Planck Institute of Quantum Optics, Theory Division, Garching (Germany), April 1st - July 3rd.
75. **2004:** Groupe de Physique des Solides, CNRS UMR, Universités Pierre et Marie Curie 6 et Denis Diderot Paris 7, Paris (France), June 2nd-6th.
76. **2003:** Center for Theoretical Physics, Massachusetts Institute of Technology (MIT), Cambridge MA (U.S.), January 9th - February 9th.

12 Teaching experience

12.1 Supervision

1. **Postdoc:** Saeed Jahromi and Jonathan D'Emidio at DIPIC.
2. **PhD thesis:** Philipp Schmoll, Augustine Kshetrimayum (Summa Cum Laude) at Universität Mainz. Jacob Jordan (co-supervisor), Sukhwinder Singh (co-supervisor), Chris Foster (independent advisor), at University of Queensland.
3. **Master/Honours thesis:** Marc Ziegler (with university prize), Kai Zapp, Serkan Sahin, Philipp Schmoll, at Universität Mainz. David Evans, at University of Queensland.
4. **Bachelor thesis:** Andreas Haller (co-supervisor) at Universität Mainz.
5. **Seminars:** Marc Ziegler (Seminar I+II WS13/14), Konstantin Bob (Präzisionsmessungen SS16), Román Picazo, Elisa Lohfink and Muhammed Celik (Fehlerkorrektur WS16/17), at Universität Mainz.

12.2 University lectures

1. **WS17/18:** (i) Introduction to Quantum Computation, Universität Mainz. Theory and exercises -in English-; (ii) Theorie 6c, Universität Mainz, together with Peter van Dongen and Matteo Rizzi. Theory and exercises on quantum Hall effect and topological order -one third of the course, in English-.
2. **SS17:** Einführung in die Theorie kondensierter Materie (Introduction to Condensed Matter Theory \approx Solid State Physics), Universität Mainz. Theory lectures -in German-.
3. **WS16/17:** Rechenmethoden 2 (Mathematical Methods 2), Bachelor of Education, Universität Mainz. Theory lectures -in German-.
4. **SS16:** Einführung in die Theorie kondensierter Materie (Introduction to Condensed Matter Theory \approx Solid State Physics), Universität Mainz. Theory lectures -in German-.
5. **WS15/16:** Rechenmethoden 2 (Mathematical Methods 2), Bachelor of Education, Universität Mainz. Theory lectures -in German-.
6. **SS15:** Einführung in die Theorie kondensierter Materie (Introduction to Condensed Matter Theory \approx Solid State Physics), Universität Mainz. Theory lectures -in German-.
7. **WS14/15:** Introduction to Quantum Computation, Universität Mainz. Theory and exercises -in English-.
8. **SS14:** Entanglement in many-body systems: concepts and algorithms, Universität Mainz. Theory, exercises and computer programming -in English-.
9. **WS13/14:** Introduction to Quantum Computation, Universität Mainz. Theory and exercises -in English-.
10. **SS13:** Entanglement in many-body systems: concepts and algorithms, Universität Mainz, together with Matteo Rizzi. Theory, exercises and computer programming -in English-.
11. **WS05/06:** Anàlisi II, University of Barcelona. Exercises -in Catalan and Spanish-.
12. **WS04/05:** Física 1 for Chemical Engineering Degree, University of Barcelona. Exercises and laboratory -in Catalan and Spanish-.

For scanned scripts of my lectures, see www.romanorus.com/?page_id=364

...and for a blackboard lecture in German on a Friday evening see [this picture](#)

12.3 Other teaching

1. **2020:** Intensive Course on Quantum Computing, 20h of lectures, Faculty of Computer Science, University of the Basque Country, March 5th – 18th (rescheduled to autumn 2020 due to the COVID-19 pandemic).
2. **2012 - 2019:** Invited lecturer in Les Houches -three times!- (France), CFM (San Sebastián, Spain), Universidad Menéndez Pelayo (Santander, Spain), UPF Summer Lectures (Barcelona, Spain), ESI (Vienna, Austria), ISSP (Kashiwa, Japan), Nat. Univ. of Taiwan (Taipei, Taiwan), Rikken (Kobe, Japan), Dresden (DPG meeting), , Jouvence (Canada), UAB (Barcelona), Southampton (UK), DIPC (Spain), EHU -twice- (Spain), Postech (South Korea), Univ. Ghent (Belgium), MITP (Mainz), Galileo Galilei Institute (Florence).

For an example of recorded lecture (Japan 2016), see www.youtube.com/watch?v=jYQjNbZ1yFY

3. **1997-1998:** Individual lectures of mathematics, physics and chemistry to high-school students.

13 Service to profession

13.1 Political

1. **2019:** President of the Grupo Especializado de Información Cuántica (GEIC) at the [Real Sociedad Española de Física \(RSEF\)](#).

13.2 Editor

1. **2016:** Founding and coordinating (since 2018) editor of [QUANTUM](#).

13.3 Mentoring

1. **2017:** Mentor of the [International Mentoring Foundation for the Advancement of Higher Education \(IMFAHE\)](#).

13.4 Reviewer

1. **2020:** ESF College of Experts.
2. **2020:** Cambridge University Press.
3. **2019:** National Science Center, Poland.
4. **2019:** Austrian Academy of Sciences (ÖAW), Austria.
5. **2019:** National Science Foundation (NSF), USA.
6. **2018:** Swiss National Science Foundation (SNSF).
7. **2018:** Italian Ministry of Education, Universities and Research (MIUR).
8. **2018:** Barcelona Supercomputing Center, STAR program.
9. **2017, 2019, 2020:** Agencia Estatal de Investigación, Spain
10. **2016, 2017:** US - Israel Binational Science Foundation
11. **2016, 2017, 2019, 2020:** Alexander von Humboldt Foundation, Germany
12. **2015, 2016, 2018:** Deutsche Forschungsgemeinschaft (DFG), Germany
13. **2014, 2016:** Förderung der wissenschaftlichen Forschung (FWF), Austria.
14. **2014, 2015, 2020:** Research Foundation - Flanders (FWO)
15. **2014:** CRC Press.
16. **2014:** Oxford University Press.
17. **2013:** Deutsch-Französische Hochschule.
18. **2012:** Netherlands Organisation for Scientific Research (Dutch Research Council).
19. **2008:** South Africa National Research Foundation.

13.5 Journal referee

1. IEEE Latin America Transactions, Risk.net, Crystal, Quantum Science and Technology, Quantum, Physical Review X, Nature Physics, Nature Physics Quantum Information, SciPost, Nature Communications, Physical Review Letters, Physical Review A, Physical Review E, European Physical Journal B, Journal of Statistical Mechanics: theory and experiment (JSTAT), Physica A, Quantum Information and Computation, Quantum Information Processing, Journal of Physics A: Mathematical and Theoretical, Journal of Physics B: Atomic, Molecular and Optical Physics, New Journal of Physics, Physica Scripta, Annals of Physics, Symmetry, Integrability and Geometry: Methods and Applications, Journal of Physics: Condensed Matter, International Journal of Modern Physics B, and Journal of Chemical Physics.

14 Institution service

1. **2019:** Organizer of the “Quantum Ideas” meeting at DIPC (Spain).
2. **2013 - 2018:** Organizer of regular group meetings and tutorials within the KOMET 337 group at the university in Mainz, together with Jun.-Prof. M. Rizzi, on several aspects of strongly correlated systems and quantum many-body entanglement.
3. **2013 - 2018:** Co-leader of one the user-groups of the university computer cluster MOGON in Mainz (Germany).
4. **2010-2013:** Co-organizer of the regular “Condensed Matter Therapy” meetings at the Max Planck-Institute of Quantum Optics (Germany).
5. **2009-2010:** Cluster lead website of the group of G. Vidal at the University of Queensland (Australia).
6. **2005-2006:** Website of the quantum information and computation group at the University of Barcelona (Spain).
7. **2004-2006:** Representative of the PhD students at the Department’s Council of the Departament d’Estructura i Constituents de la Matèria of the University of Barcelona (Spain).

15 Outreach and media

1. **2020:** Highlight in Protocol on quantum computing for finance ([Link](#))
2. **2020:** Highlight and interview about Multiverse Computing in Expansión ([LinkedIn Post](#))
3. **2020:** Highlight of Multiverse Computing in The Quantum Daily ([Link](#))
4. **2020:** Highlight of EmprendedorXXI - Multiverse Computing in Noticias de Álava ([Link](#))
5. **2020:** Highlight of Multiverse Computing in Expansión ([Link](#))
6. **2020:** Highlight of Multiverse Computing in Quantumzeitgeist ([Link](#))
7. **2020:** Highlight in La Nueva Crónica, on quantum supremacy ([Link](#))
8. **2019:** Highlight of Bankia Fintech - Multiverse ([Bankia](#), [EmprendeRioja](#), [Es Diario](#), [E2020](#), [Levante](#), [El Plural](#), [ICNR.es](#))
9. **2019:** Highlight of Manuel Laborde Werlinden Prize ([UPV/EHU](#), [Noticias de Gipuzkoa](#), [MMA Ingenieria](#), [EuropaPress](#), [Gestionidi](#))
10. **2019:** Highlight of Fujitsu - Multiverse agreement ([MMA Ingenieria](#), [Computer World](#), [Venezuela Shafaqna](#), [Bahiaa](#), [Fujitsu](#), [Silicon.es](#), [Economiadehoy.es](#), [EFE](#), [Invertia](#), [Repro](#), [Repro](#), [Deviceneews](#), [Investing.com](#), [Enterprenari](#), [Noticias de Gipuzkoa](#), [Deia](#), [Diario de Navarra](#))
11. **2019:** Highlight in Mapping Ignorance, on tensor networks ([Link](#))
12. **2019:** Highlight in Berria on Quantum Computing, in Basque ([Link](#))
13. **2019:** Highlight in Retina LTD - El País on Quantum Technologies ([Link](#))
14. **2019:** Highlight in Ametic News on Round Table in Quantum Technologies ([Link](#))
15. **2019:** Highlight of Multiverse Computing as finalist of Toribio Echevarria prize in [El Diario Vasco](#)
16. **2019:** Highlight in EIC Noticias, on a talk about quantum technologies, in Catalan ([Link](#))
17. **2019:** Highlight in MIT Technology Review, on pricing financial derivatives with IBM-Q ([Link](#))
18. **2019:** Highlight in Mapping Ignorance, on 2d annealing with tensor networks ([Link](#))
19. **2019:** Highlight in Technology Review, on a talk about quantum computing for finance, in German ([Link](#))
20. **2019:** Highlight in Heraldo de Aragón on Benasque workshop, in Spanish ([Link](#))
21. **2019:** Interview for Berria, on quantum computing, in Basque ([Link](#))
22. **2019:** Highlight of DIPC-BSC agreement ([El Diario Vasco](#), [La Vanguardia](#))
23. **2018:** Highlight of Multiverse Computing in [Expansión](#)
24. **2018:** Outreach article on predicting financial crashes with quantum computing in [Medium](#)
25. **2018:** Outreach article on quantum computing for finance in [Medium](#)
26. **2018:** Outreach article on quantum complex systems in [Open Access Government](#)
27. **2018:** Outreach article on quantum complex systems in [Scientia](#)
28. **2017:** Interview for Tecnología y Sentido Común, Capital Radio, on quantum technologies, in Spanish ([Link – minute 45 –](#))
29. **2016:** Interview for Aragón Radio on Benasque workshop, in Spanish ([Link – minute 34:20 –](#))
30. **2015:** Highlight of tensor networks in Quanta Magazine ([Link](#))
31. **2014:** Highlight of tensor networks in ScienceNews ([Link1](#), [Link2](#))
32. **2014:** Interview for Youtube Channel Benasque ConCiencia, in Spanish ([Link](#))
33. **2012:** Interviews for Cadena Ser and Cadena Cope on Benasque workshop, in Spanish ([Link](#))
34. **2008:** Collaborator of the science and technology blogs in Spanish [e-ciencia](#) and [Que Ciencia](#)

16 Professional memberships

1. **2019:** Quantum Life Science (QLS) Think-Tank.
2. **Since 2019:** Real Sociedad Española de Física (RSEF).
3. **Since 2017:** “Quantum for Quants” commission, Quantum World Association (QWA).
4. **Since 2013:** Deutsche Physikalische Gesellschaft (DPG).
5. **2013 - 2018:** MAINZ Graduate School of Excellence, Johannes Gutenberg-Universität.
6. **2013 - 2018:** Center for Computational Sciences, Johannes Gutenberg-Universität.
7. **2013 - 2018:** Deutscher Hochschulverband.
8. **Since 2011:** Marie Curie Fellows Association.
9. **Since 2008:** American Physical Society (APS).
10. **Since 2008:** Institute of Physics (IOP).

17 Further relevant information

1. **2020:** Multiverse Computing graduates from Creative Destruction Lab and closes a pre-seed funding round of $\approx 1 - 1.5\text{M}\text{€}$, including private and non-dilutive funding.
2. **2019:** My review in Reviews in Physics (Ref.9) is one of the most frequently downloaded papers from this journal.
3. **2019:** Multiverse Computing is the only quantum startup cited (twice!) in the IBM report “Getting your financial institution ready for the quantum computing revolution”.
4. **2019:** Multiverse Computing is one of the first European startups invited to attend the Creative Destruction Lab acceleration program on Quantum Machine Learning in Toronto, as well as the first quantum startup accelerated by BIC Gipuzkoa and Bankia Fintech.
5. **2019:** Promoter of an institutional collaboration agreement between the Donostia International Physics Center (DIPC) and the Barcelona Supercomputing Center (BSC), see [this link](#).
6. **2014:** Invited by the editors to write a Review Paper for Nature Reviews Physics (Ref.5).
7. **2018:** As an outreach project, I collaborated with an illustrator and an engineer in order to develop a board game to learn physics, and specially quantum mechanics, see [this link](#).
8. **2018:** My paper on predicting financial crashes with quantum computing (Ref.4) had more than 4000 visualizations on LinkedIn on its first week.
9. **2018:** My review in Annals of Physics (Ref.26) is the most cited paper published in this journal since 2012, and one of the most frequently downloaded ones.
10. **2014-2018:** Approached by Oxford University Press, Springer, and de Reuter, in order to write a book on tensor network states and methods (in the end, contract with Oxford University Press).
11. **2014:** Invited by the editors to write a Colloquium Review Paper for European Physical Journal B (Ref.25).
12. **2013-2019:** Examiner at the university in Mainz of the PhD theses of Franziska Hagelstein and Marcel Bergmann, the Master theses of Pascal Michel, Alexander Roth, Marc Ziegler, Kai Zapp, and Serkan Sahin, the Bachelor thesis of Román Picazo, Pascal Michel and Andreas Haller. External examiner of the PhD thesis of Carlos Fernández at the Universidad Complutense de Madrid (Spain) and of Adrian Steffens at FAU Berlin (Germany), and alternate member of the examiner committee of the PhD thesis of Carlos González-Guillén, both supervised at the Universidad Complutense de Madrid (Spain). I was also part of the PhD thesis evaluation committee of Thibaut Picot at CNRS in Toulouse (France), Abel Yuste at UAB in Barcelona (Spain), and José Garre-Rubio at UCM in Madrid (Spain).

18 Computer skills

1. Languages: Python, Matlab, Mathematica, Fortran, a bit of C. Learning Julia in the perspective.
2. Methods: Tensor networks, Monte Carlo, machine learning (TensorFlow, Keras), molecular dynamics, genetic algorithms...
3. Libraries for quantum computing: Qiskit, Cirq, Penny Lane, Strawberry Fields, Forest, Ocean, Leap...
4. User experience with high-end workstations, clusters and supercomputers, GitHub, Jupyter Notebooks, Slack...
5. Basics on blockchain ecosystem (bitcoin, ethereum, ICOs, etc).

19 Languages

1. **Spanish:** native.
2. **Catalan:** native.
3. **English:** proficient. Cambridge Certificate in Advanced English in 2002.
4. **German:** advanced.
5. **French:** medium.
6. **Euskera:** learning.

20 Non-academic skills

1. Music: studies at Aula de Música Moderna y Jazz, Torreta, Passatge and Taller de Músics in Barcelona (Spain). Instrument: electric guitar.
2. Diving: Advanced Adventurer Diver certified by SSI (Scuba Schools International) since September 2010. 30+ logged dives.
3. Long online courses: economy and investment (Tutellus), communication (Tutellus).
4. For fun: playing with my kid, cooking, running, swimming, reading everything, videogaming, playing board games, listening everything, sci-fy, piloting drones, playing my guitars...

21 References

In alphabetical order:

21.1 Academic

1. **Ignacio Cirac**
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Hans-Kopfermann-Str. 1, Garching, Germany
ph: (+ 49 89) 3 29 05 - 736, (705); e-mail: ignacio.cirac@mpq.mpg.de
2. **Peter van Dongen**
Institut für Physik, KOMET 337, Johannes Gutenberg-Universität
Staudingerweg 7, 55099 Mainz, Germany
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3. **José I. Latorre**
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4. **Didier Poilblanc**
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6. **Julien Vidal**

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21.2 Business

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