

Paolo Perinotti

Dipartimento di Fisica
Università degli studi di Pavia
Via A. Bassi 6
27100 Pavia (PV) Italy
Phone: +39 03829876756

Email: paolo.perinotti@unipv.it
URL: <https://wordpress.qubit.it/people/perinotti/>

Born: April 24, 1975—Vercelli, Italy
Nationality: Italian

Current position

Associate Professor, Dipartimento di Fisica, Università degli studi di Pavia

Areas of specialisation

Theoretical Physics; Quantum Mechanics, Quantum Information Theory, Quantum Foundations

Appointments held

2011-2017	Staff Researcher at University of Pavia, Physics Department
2011	Research contractor—COQUIT project at Dipartimento di Fisica “A. Volta”, Università di Pavia
2006-2011	Post-doc at Dipartimento di Fisica “A. Volta”, Università di Pavia
2006	Research Contractor of “Dipartimento di Fisica A. Volta” of the University of Pavia
2005	Research Contractor of INFN Unità di Pavia
2003-2005	Post-doc at Istituto Nazionale di Fisica della Materia (INFN)

Education

1999	MSc in Physics, University of Pavia, Italy (Advisors: G. M. D’Ariano and C. Macchiavello)
2003	PhD in Physics, University of Milano (advisor: L. Lanz)

Grants, honours & awards

2016	“Birkhoff-von Neumann prize” for research in quantum foundations (IQSA).
------	--

MEMBERSHIP

- 2013-present Member of FQXi (Foundational Questions Institute)
2001-present Member of IQSA (International Quantum Structures Association)

OFFICES

- 2018-2022 Member of the Council of the International Quantum Structures Association

Research

BIBLIOGRAPHIC INDICES

TOTAL PUBLICATIONS: 118 published papers
H-INDEX: 37 (google scholar) · 35 (ResearchGate) · 29 (Scopus) · 27 (WOS)
TOTAL CITATIONS 6873 (google scholar) · 6402 (ResearchGate) · 4073 (Scopus) · 3702 (WOS)

RESEARCH INTERESTS

Quantum Information and Quantum Foundations. Quantum Cellular Automata and Quantum Field Theory. Operational probabilistic theories. Quantum Theory of Measurements and Open Systems. Quantum Information Processing and Optimization.

ADDITIONAL EXPERTISE

General Quantum Mechanics, Quantum Optics, Group Theory, Lie algebras, Frame Theory, Quantum Field Theory, Statistical Mechanics.

SHORT TERM VISITS

- 2019 Turku University, visiting Teiko Heinosaari
2017 Perimeter Institute, Waterloo, Canada, visiting Rob Spekkens and Lucien Hardy
2016 University of Paris Sud, visiting Romain Tessera
2016 Oxford University, visiting Cornelia Druțu
2016 Vienna University and IQOQI, visiting Časlav Brukner
2016 Pisa University, visiting Roberto Frigerio
2013 Tsinghua University, Beijing, visiting Giulio Chiribella
2011 CQT, National University of Singapore, visiting Valerio Scarani
2011 Turku University, visiting Pekka Lahti and Teiko Heinosaari
2010 Slovak Academy of science, Bratislava, visiting Vladimír Bužek and Mario Ziman
2010 Perimeter Institute, Waterloo, Canada, visiting Giulio Chiribella
2008 Universidad Complutense, Madrid, visiting David Perez-Garcia

FUNDED PROJECTS

- 2023-2025 P. I. of PRIN-2022 QCAPP (Quantum Cellular Automata via Photonic Platforms)
2023-2025 Participant of PRIN-2022-PNRR DISTRUCT (Discrete Quantum Simulators with Structured Light) (P. I. Alessandro Bisio)
2022-2025 Critical Mass of Spoke 1, National Quantum Science and Technology Institute NQSTI23

- 2016-2019 Local P. I. in the network project *Quantum Causal Structures* led by Časlav Brukner and Rob Spekkens, funded by the John Templeton Foundation.
- 2014 Proponent with Lorenzo Maccone of the funded project *A quantum-digital universe*, funded by Fondazione Banca del Monte di Lombardia

P.P. participated in the European projects ATESIT (FP6), CORNER and COQUIT (FP7), in three Italian national projects (PRIN), and in the Project “Quantum Digital Universe”, funded by the John Templeton Foundation.

Publications & talks

JOURNAL ARTICLES

1. A. Suprano, D. Zia, E. Polino, D. Poderini, G. Carvacho, F. Sciarrino, M. Lugli, A. Bisio, P. Perinotti, *Photonic cellular automaton simulation of relativistic quantum fields: observation of Zitterbewegung*, Phys. Rev. Research (accepted).
2. M. Erba, P. Perinotti, D. Rolino, and A. Tosini, *Measurement incompatibility is strictly stronger than disturbance*, Phys. Rev. A **109**, 022239 (2024)
3. E. Centofanti, P. Perinotti, and A. Bisio, *Massless interacting fermionic cellular automaton exhibiting bound states*, Phys. Rev. A **109**, 052421 (2024)
4. L. Apadula, A. Bisio, and P. Perinotti, *No-signalling constrains quantum computation with indefinite causal structure*, Quantum **8**, 1241 (2024)
5. F. Buscemi, K. Kobayashi, S. Minagawa, P. Perinotti, and A. Tosini, *Unifying different notions of quantum incompatibility into a strict hierarchy of resource theories of communication*, Quantum **7**, 1035 (2023)
6. G. M. D’Ariano, P. Perinotti, and A. Tosini, *Incompatibility of observables, channels and instruments in information theories*, J. Phys. A Math. Theor. **55**, 394006 (2022)
7. P. Perinotti, A. Tosini, L. Vaglini, *Shannon theory beyond quantum: information content of a source*, Phys. Rev. A **105**, 052222 (2022)
8. P. Perinotti, *Causal influence in operational probabilistic theories*, Quantum **5**, 515 (2021)
9. M. Lugli, P. Perinotti, and A. Tosini, *Unambiguous discrimination of Fermionic states through local operations and classical communication*, Phys. Rev. A **103**, 012416 (2021)
10. A. Bisio, N. Mosco, P. Perinotti, *Scattering and perturbation theory for discrete-time dynamics*, Phys. Rev. Lett. **126**, 250503 (2021)
11. G. M. D’Ariano, P. Perinotti, and A. Tosini, *Information and disturbance in operational probabilistic theories*, Quantum **4**, 363 (2020)
12. G. M. D’Ariano, M Erba, and P. Perinotti, *Classicality without local discriminability: Decoupling entanglement and complementarity*, Phys. Rev. A **102**, 052216 (2020)
13. M. Lugli, P. Perinotti, and A. Tosini, *Fermionic State Discrimination by Local Operations and Classical Communication*, Phys. Rev. Lett. **125**, 110403 (2020)

14. L. Apadula, A. Bisio, G. M. D'Ariano, and P. Perinotti, *Symmetries of the Dirac quantum walk and emergence of the de Sitter group*, J. Math. Phys. **61**, 082202 (2020)
15. P. Perinotti, *Cellular Automata in Operational Probabilistic Theories*, Quantum **4**, 294 (2020)
16. G. M. D'Ariano, M. Erba, and P. Perinotti, *Classical theories with entanglement*, Phys. Rev. A **101**, 042118 (2020)
17. G. M. D'Ariano and P. Perinotti, *Quantum information and foundations*, Entropy, **22**, 22 (2020)
18. A. Bisio and P. Perinotti, *Theoretical framework for higher-order quantum theory*, Proc. Roy. Soc. A **475**, 20180706 (2019)
19. G. M. D'Ariano, M. Erba, and P. Perinotti, *Chirality from quantum walks without a quantum coin*, Phys. Rev. A **100**, 012105 (2019)
20. P. Perinotti and L. Poggiali, *Scalar fermionic cellular automata on finite Cayley graphs*, Phys. Rev. A **98**, 052337 (2018)
21. A. Bisio, G. M. D'Ariano, N. Mosco, P. Perinotti, and A. Tosini, *Solutions of a Two-Particle Interacting Quantum Walk*, Entropy **20**, p. 435 (2018)
22. A. Bisio, G. M. D'Ariano, P. Perinotti, and A. Tosini, *Thirring quantum cellular automaton*, Phys. Rev. A **97**, 032132 (2018)
23. G. Jaeger, A. Khrennikov and P. Perinotti, *Preface for the special issue*, Second quantum revolution: foundational questions, Phil. Trans. Roy. Soc. A **375** (2017)
24. G. M. D'Ariano, M. Erba, and P. Perinotti, *Isotropic quantum walks on lattices and the Weyl equation*, Phys. Rev. A **96**, 062101 (2017)
25. A. Bisio, G. M. D'Ariano, and P. Perinotti, *Quantum Walks, Weyl Equation and the Lorentz Group*, Found. Phys. **47**, 1065-1076 (2017)
26. P. Perinotti, *Causal Structures and the Classification of Higher Order Quantum Computations*, in *Time in Physics*, Renner R., Stupar S. (eds.) Tutorials, Schools, and Workshops in the Mathematical Sciences. Birkhäuser, Cham
27. G. M. D'Ariano, M. Erba, P. Perinotti, and A. Tosini, *Virtually Abelian Quantum Walks*, J. Phys. A: Math. Theor. **50**, 035301 (2017)
28. G. M. D'Ariano and P. Perinotti, *Quantum cellular automata and free quantum field theory*, Front. Phys. **12**(1), 120301 (2017)
29. A. Bisio, G. M. D'Ariano, and P. Perinotti, *Special relativity in a discrete quantum universe*, Phys. Rev. A **94**, 042120 (2016)
30. A. Bisio, G. M. D'Ariano, M. Erba, P. Perinotti, A. Tosini, *Quantum walks without quantum coin*, Phys. Rev. A **93**, 062334 (2016)

31. G. M. D'Ariano, N. Mosco, P. Perinotti, A. Tosini, *Discrete time Dirac quantum walk in $3+1$ dimensions*, Entropy **18**, 228 (2016)
32. A. Bisio, M. Dall'Arno, P. Perinotti, *Quantum conditional operations*, Phys. Rev. A **94**, 022340 (2016)
33. A. Bisio, G. M. D'Ariano, P. Perinotti, *Quantum cellular automaton theory of light*, Ann. Phys. **368**, pp. 177-190 (2016)
34. G. M. D'Ariano and P. Perinotti, *Quantum Theory is an Information Theory. The Operational Framework and the Axioms*, Found. Phys. **46**, 269 (2016)
35. A. Bisio, G. M. D'Ariano, P. Perinotti, *Quantum walks, deformed relativity, and Hopf algebra symmetries*, Phil. Trans. R. Soc. A **374**, 20150232 (2016)
36. A. Bisio, G. M. D'Ariano, P. Perinotti, A. Tosini, *Free quantum field theory from quantum cellular automata: derivation of Weyl, Dirac and Maxwell quantum cellular automata*, Found. Phys. **45**, pp. 1137-1152 (2015)
37. A. Bisio, G. M. D'Ariano, P. Perinotti, A. Tosini, *Weyl, Dirac and Maxwell Quantum Cellular Automata: analytical solutions and phenomenological predictions of the Quantum Cellular Automata Theory of Free Fields*, Found. Phys. **45**, pp. 1203-1221 (2015)
38. G. M. D'Ariano, N. Mosco, P. Perinotti, A. Tosini, *Discrete Feynman propagator for the Weyl quantum walk in $2+1$ dimensions*, EPL **109**, 40012 (2015)
39. A. Bibeau-Delisle, A. Bisio, G. M. D'Ariano, P. Perinotti, A. Tosini, *Doubly-Special Relativity from Quantum Cellular Automata*, EPL **109**, 50003 (2015)
40. G. M. D'Ariano and P. Perinotti, *Derivation of Dirac equation from principles of information processing*, Phys. Rev. A **90**, 062106 (2014)
41. G. M. D'Ariano, N. Mosco, P. Perinotti, A. Tosini, *Path-integral solution of the one-dimensional Dirac quantum cellular automaton*, Phys. Lett. A **378**, pp. 3165-3168 (2014)
42. G. M. D'Ariano, F. Manessi, P. Perinotti, A. Tosini, *The Feynman problem and Fermionic entanglement: Fermionic theory versus qubit theory*, Int. J. Mod. Phys. A **29**, 1430025 (2014)
43. G. M. D'Ariano, F. Manessi, P. Perinotti, A. Tosini, *Fermionic computation is non-local tomographic and violates monogamy of entanglement*, EPL **107**, 20009 (2014)
44. A. Bisio, G. M. D'Ariano, P. Perinotti, M. Sedláčková, *Optimal processing of reversible quantum channels*, Phys. Lett. A **378**, p. 1797 (2014)
45. G. Chiribella, G. M. D'Ariano, P. Perinotti, B. Valiron, *Quantum computations without definite causal structure*, Phys. Rev. A **88**, 022318 (2013)
46. A. Belenchia, G. M. D'Ariano, P. Perinotti, *Universality of Computation in Real Quantum Theory*, EPL **104**, 20006 (2013)
47. D. Burgarth, G. Chiribella, V. Giovannetti, P. Perinotti, and K. Yuasa, *Ergodic and Mixing Quantum Channels in Finite Dimensions*, New J. Phys. **15**, 073045 (2013)

48. G. Chiribella, G. M. D'Ariano, P. Perinotti, D. M. Schlingemann, R. F. Werner, *A short impossibility proof of Quantum Bit Commitment*, Phys. Lett. A **377**, pp. 1076-1087 (2013)
49. G. Chiribella, V. Giovannetti, L. Maccone, P. Perinotti, *Teleportation transfers only speakable quantum information*, Phys. Rev. A **86**, 010304(R) (2012)
50. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Quantum Theory, namely the pure and reversible theory of information*, Entropy, **14**, pp. 1877-1893 (2012)
51. P. Perinotti *Discord and non-classicality in probabilistic theories*, Phys. Rev. Lett. **108**, 120502 (2012)
52. A. Bisio, G. M. D'Ariano, P. Perinotti, and M. Sedlák, *Memory cost of quantum protocols*, Phys. Rev. A **85**, 032333 (2012)
53. T. Colnaghi, G. M. D'Ariano, P. Perinotti, and S. Facchini, *Quantum computation with programmable connections between gates*, Phys. Lett. A **376**, pp. 2940-2943 (2012)
54. G. M. D'Ariano, F. Manessi, and P. Perinotti, *Spooky action at a distance in general probabilistic theories*, Phys. Lett. A **376**, pp. 2926-2930, (2012)
55. A. Bisio, G. M. D'Ariano, P. Perinotti, and M. Sedlák, *Cloning of a quantum measurement*, Phys. Rev. A **84**, 042330 (2011)
56. G. M. D'Ariano, P. Perinotti, M. Sedlák *Extremal quantum protocols*, J. Math. Phys. **52**, 082202 (2011)
57. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Informational derivation of Quantum Theory*, Phys. Rev. A **84**, 012311 (2011)
58. A. Bisio, G. M. D'Ariano, P. Perinotti, and M. Sedlák, *Quantum learning algorithms for quantum measurements*, Phys. Lett. A **375** (2011), pp. 3425-3434.
59. A. Bisio, G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Quantum Networks: General Theory and Applications*, Acta Physica Slovaca **61**, 273-390 (2011)
60. G. Chiribella, M. Dall'Arno, G. M. D'Ariano, C. Macchiavello, and P. Perinotti, *Quantum error correction with degenerate codes for correlated noise*, Phys. Rev. A **83**, 052305 (2011)
61. A. Bisio, G. M. D'Ariano, P. Perinotti, and G. Chiribella, *Minimal computational-space implementation of multiround quantum protocols*, Phys. Rev. A **83**, 022325 (2011)
62. G. M. D'Ariano, S. Facchini, and P. Perinotti, *No Signaling, Entanglement Breaking, and Localizability in Bipartite Channels*, Phys. Rev. Lett. **106**, 010501 (2011)
63. A. Bisio, G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Information-disturbance tradeoff in estimating a unitary transformation* Phys. Rev. A **82**, 062305 (2010)
64. A. Bisio, G. Chiribella, G. M. D'Ariano, S. Facchini, and P. Perinotti, *Optimal quantum learning of a unitary transformation* Phys. Rev. A **81**, 032324 (2010)
65. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Probabilistic theories with purification*, Phys. Rev. A **81**, 062348 (2010)

66. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Theoretical framework for quantum networks*, Phys. Rev. A **80**, 022339 (2009)
67. G. M. D'Ariano and P. Perinotti, *Quantum no-stretching: A geometrical interpretation of the no-cloning theorem*, Phys. Lett. A. **373**, 2416 (2009)
68. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Realization schemes for quantum instruments in finite dimensions*, J. Math. Phys. **50**, 042101 (2009)
69. G. M. D'Ariano, D. F. Magnani, and P. Perinotti, *Adaptive Bayesian and frequentist data processing for quantum tomography*, Phys. Lett. A. **373**, pag. 1111 (2009)
70. A. Bisio, G. Chiribella, G. M. D'Ariano, S. Facchini, and P. Perinotti, *Optimal quantum tomography*, IEEE J. Sel. Top. Quantum Electron. **15**, 1646 (2009)
71. A. Bisio, G. Chiribella, G. M. D'Ariano, S. Facchini, P. Perinotti, *Optimal quantum tomography for states, measurements, and transformations*, Phys. Rev. Lett. **102**, 010404 (2009)
72. G. M. D'Ariano, S. Facchini, P. Perinotti, and M. F. Sacchi, *Probability-fidelity tradeoffs for targeted quantum operations*, Phys. Lett. A **373**, 3011 (2009)
73. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Optimal cloning of unitary transformation*, Phys. Rev. Lett. **101**, 180504 (2008)
74. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Memory effects in quantum channel discrimination*, Phys. Rev. Lett. **101**, 180501 (2008)
75. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Quantum Circuits Architecture*, Phys. Rev. Lett. **101**, 060401 (2008)
76. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Transforming quantum operations: quantum supermaps*, Europhys. Lett. **83**, 30004 (2008)
77. G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Quantum indirect estimation theory and joint estimates of all moments of two incompatible observables*, Phys. Rev. A, **77**, 052108 (2008)
78. G. M. D'Ariano, R. Demkowicz-Dobrzanski, P. Perinotti, and M. F. Sacchi, *Quantum state decorrelation*, Phys. Rev. A **77**, 032344 (2008)
79. G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Superbroadcasting of harmonic oscillators mixed states*, Optics and Spectroscopy **103**, 170-176 (2007)
80. G. M. D'Ariano, R. Demkowicz-Dobrzanski, P. Perinotti, and M. F. Sacchi, *Erasable and Unerasable Correlations*, Phys. Rev. Lett. **99**, 070501 (2007)
81. G. Chiribella, L. Maccone, and P. Perinotti, *Secret Quantum Communication of a Reference Frame*, Phys. Rev. Lett. **98**, 120501 (2007)
82. G. M. D'Ariano and P. Perinotti, *Optimal data processing for quantum measurements*, Phys. Rev. Lett. **98**, 020403 (2007)

83. G. Chiribella, F. Buscemi, G. M. D'Ariano, C. Macchiavello, and P. Perinotti, *Superbroadcasting and classical information*, Phys. Rev. A **75**, 012315 (2007)
84. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Applications of the group $SU(1,1)$ for quantum computation and tomography*, Laser Physics **16**, 1572 (2006)
85. F. Buscemi, G. M. D'Ariano, C. Macchiavello and P. Perinotti, *Universal and phase covariant superbroadcasting for mixed qubit states*, Phys. Rev. A **74**, 042309 (2006)
86. G. Chiribella, G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Maximum likelihood estimation for a group of physical transformations*, Int. J. Quant. Inf. **4**, 453 (2006)
87. G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Superbroadcasting of conjugate quantum variables*, Europhys. Lett. **75**, 195 (2006)
88. G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Superbroadcasting of continuous variable mixed states*, New J. Phys. **8**, 99 (2006)
89. G. M. D'Ariano, V. Giovannetti, and P. Perinotti, *Optimal estimation of quantum observables*, J. Math. Phys. **47**, 022102 (2006)
90. G. Chiribella, G. M. D'Ariano, P. Perinotti, and N. Cerf, *Extremal quantum cloning machines*, Phys. Rev. A **72**, 042336 (2005)
91. G. M. D'Ariano, C. Macchiavello, P. Perinotti, *Optimal phase estimation for qubits in mixed states*, Phys. Rev. A **72** 042327 (2005)
92. G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Informationally complete measurements on bipartite quantum systems: Comparing local with global measurements*, Phys. Rev. A **72**, 042108 (2005)
93. G. M. D'Ariano, C. Macchiavello, and P. Perinotti, *Superbroadcasting of mixed states*, Phys. Rev. Lett. **95**, 060503 (2005)
94. F. Buscemi, G. M. D'Ariano, M. Keyl, P. Perinotti, and R. F. Werner, *Clean Positive Operator Valued Measures*, J. Math. Phys. **46**, 082109 (2005)
95. G. M. D'Ariano, P. Perinotti, and P. Lo Presti, *Classical randomness in quantum measurements*, J. Phys. A: Math. Gen. **38**, 5979-5991 (2005)
96. G. M. D'Ariano and P. Perinotti, *Efficient universal programmable quantum measurements*, Phys. Rev. Lett. **94**, 090401 (2005)
97. G. Chiribella, G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Covariant quantum measurements which maximize the likelihood*, Phys. Rev A **70**, 062105 (2004)
98. G. Chiribella, G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Efficient use of quantum resources for the transmission of a reference frame*, Phys. Rev. Lett. **93**, 180503 (2004)
99. G. M. D'Ariano and P. Perinotti, *On the realization of Bell observables*, Phys. Lett. A **329**, 188-192 (2004)

100. G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Informationally complete measurements and groups representation*, J. Opt. B: Quantum Semiclass. Opt. **6**, S487-S491 (2004)
101. F. Buscemi, G. M. D'Ariano and P. Perinotti, *There Exist Nonorthogonal Quantum Measurements that are Perfectly Repeatable*, Phys. Rev. Lett. **92**, 070403 (2004)
102. G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Quantum Universal Detectors*, Europhys. Lett. **65**, 165 (2004)
103. F. Buscemi, G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Optimal realization of the transition maps*, Phys. Lett. A **314**, 374 (2003)
104. M. G. A. Paris, G. M. D'Ariano, P. Lo Presti, and P. Perinotti, *About the use of entanglement in the optical implementation of quantum information processing*, Fortschr. Phys. **51**, 449 (2003)
105. G. M. D'Ariano, M. G. A Paris, P. Perinotti, *To take a (binary) decision you'd better use entanglement*, J. Opt. B Quant. Semiclass. Opt. **4**, S277-S280 (2002)
106. G. M. D'Ariano, M. G. A. Paris, and P. Perinotti, *Improving quantum interferometry by using entanglement*, Phys. Rev. A **65**, 062106 (2002)
107. G. M. D'Ariano, M. G. A. Paris, and P. Perinotti, *Optimal quantum estimation of the coupling between two bosonic modes*, J. Opt. B **3**, 337 (2001)
108. G. M. D'Ariano, C. Macchiavello, P. Perinotti, M. F. Sacchi, *Isotropic phase squeezing and the arrow of time*, Phys. Lett. A **268**, 241 (2000)

PROCEEDINGS

1. P. Perinotti, *Quantum field theory from first principles*, Istituto Lombardo (Rend. Scienze) **151**, 77-107 (2017)
2. G. M. D'Ariano, F. Manessi, P. Perinotti, *Determinism without causality*, Phys. Scr. **T163**, 014013 (2014)
3. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Informational axioms for quantum theory*, in *Foundations of Probability and Physics - 6*, AIP Conf. Proc. **1424**, 270 (2012)
4. G. Chiribella, G. M. D'Ariano, and P. Perinotti, *Optimal covariant quantum networks*, in *Proceedings of the Ninth International Conference on Quantum Communication, Measurement and Computing*, A. Lvovsky ed. (American Institute of Physics, 2009), pag. 47.
5. P. Perinotti and G. M. D'Ariano, *Optimal estimation of ensemble averages from a quantum measurement*, in *Proceedings of the 8th International conference on Quantum Communication, Measurement and Computing*, Ed. by O. Hirota, J. Shapiro, and M. Sasaki, (NICT press, Japan, 2007), pag. 327.
6. G. M. D'Ariano and P. Perinotti, *On the most efficient unitary transformation for programming quantum channels*, in *Quantum Probability and Infinite Dimensional Analysis: Proceedings of the 26th Conference*, Ed. by L. Accardi, W. Freudenberg, and M. Schurmann, (World Scientific, Singapore, 2007), pag. 173.

7. F. Buscemi, G. M. D'Ariano, C. Macchiavello, and P. Perinotti, *Optimal Superbroadcasting of Qubit Mixed States*, in *13th Quantum Information Technology Symposium (QIT13)*, Tohoku University, (Sendai University Press, Sendai, 2005)
8. G. M. D'Ariano and P. Perinotti *Programmable quantum channels and measurements*, in *Quantum Information Theory and Quantum Statistical Inference* (University of Tokyo Press, Tokyo, 2005)
9. G. M. D'Ariano, P. Perinotti, and M. F. Sacchi, *Optimization of Quantum Universal Detectors*, in *Proceedings of the Conference on Squeezed States and Uncertainty Relations* ed. by H. Moya-Cessa, R. Jauregui, S. Hacyan, and O. Castanos, (Rinton Press, Princeton, 2003), pag. 86.
10. G. A. Barbosa, E. Corndorf, P. Kumar, H. P. Yuen, G. M. D'Ariano, M. G. A. Paris, and P. Perinotti, *Secure communication using coherent states*, in *Proceedings of the 4th International Conference on Quantum Communication, Measurement and Computing*, Edited by J. Shapiro and O. Hirota, (Rinton Press, Princeton, 2003), pag. 357.

INVITED TALKS

1. *A theoretical tool for discrete space-time quantum field theory: renormalisation of quantum cellular automata*, QIP₂₄, June 13th 2024, Växjö, Sweden
2. *Incompatibility and irreversibility: from Heisenberg to post-quantum theories*, IQIS 2023, September 19 2023, Trieste, Italy
3. *Information, disturbance and compatibility*, CEQIP 2023 September 5 2023, Smolenice, Slovakia
4. "Causal influence and signalling: are they the same?", Quantum Information and Probability: from Foundations to Engineering, Linnaeus University, Växjö, June 13th 2023
5. "On the Heisenberg thought experiment and notions of compatibility", Third Kyoto Workshop on Quantum Information, Computation, and Foundations (online), October 19th 2022
6. "Causal influence vs signalling: when do systems affect each other?", Quantum Corona, Siegen University, September 26th 2022
7. "Quantum cellular automata: quantum field theories and their simulation", SQMS/GGI Summer School on Quantum Simulation of Field Theories, Galileo Galilei Institute, Firenze, July 28th 2022.
8. "On the Heisenberg thought experiment and notions of compatibility", Quantum Information and Probability: from Foundations to Engineering, Linnaeus university, Växjö, June 15 2022
9. "When does a system affect another? Causal influence vs signalling", Extreme Universe - Colloquium, Yukawa Institute for Theoretical Physics, Kyoto University (online), July 14th 2022
10. *Information and disturbance*, QCQMB 2021, Virtual meeting, May 17-21 2021

11. *Operational probabilistic theories and cellular automata: how I learned to stop worrying and love C^* algebras* five lectures for the *School on Advanced Topics in Quantum Information and Foundations*, Quantum Information Unit and the Yukawa Institute for Theoretical Physics, Kyoto University (online), February 8-12 2021
12. *Causal influence in operational probabilistic theories*, QuFITs 2020, York Centre for Quantum Technologies—online workshop, October 20 2020
13. *Causal structures in higher-order quantum theory*, Workshop: Causality in the Quantum World, capri, September 17 2019
14. *Higher-order quantum theory*, IQIS 2019 Milano, September 10 2019
15. *From cellular automata to special relativity* Lecture at *Solstice of Foundations* - ETH Zurich 2019 Quantum foundations summer school, June 17-21 2019
16. *Composite systems*, Quantum Information Revolution: Impact to Foundations?, Linnaeus university, Växjö, June 11 2019
17. *Cellular automata in Operational probabilistic theories*, Quantum Cagliari 2018, University of Cagliari, October 9 2018
18. *Infinite composite systems and cellular automata in operational probabilistic theories*, Foundations of quantum mechanics, Perimeter Institute, July 30 2018
19. *Cellular Automata and interacting quantum fields*, Towards Ultimate Quantum Theory Linnaeus university, Växjö, June 12 2018
20. *Operational probabilistic theories, cellular automata, and the foundations of quantum field theory*, Three Days in Quantum Mechanics, Genova, DIFI June 6 2018
21. *Costruttivismo e realismo nelle scienze fisiche*, Lost in physics and metaphysics, Istituto Lombardo Accademia di scienze e lettere, Milano, January 25 2018
22. *Cellular automata in Operational probabilistic theories*, Workshop on Quantum Information Foundations: Focus on Physics of the Observer, Hong Kong, January 8-13 2018
23. *The hierarchy of higher-order quantum computations*, Quantum Physics and Logic Nijmegen, July 3-7 2017
24. *Cellular automata in Operational probabilistic theories*, Foundations of Quantum Mechanics and Technology, Linnaeus University, Växjö, June 12-16 2017
25. *Symmetries of quantum walks on Cayley graphs and the Lorentz group*, Workshop on Quantum Simulations and Quantum Walks, University of Prague, November 17-20 2016
26. *Quantum theory and information processing*, Birkhoff-von Neumann Prize Lecture, 13th biennial *International Quantum Structures Association Meeting*, Leicester, July 11-15 2016
27. *Interacting quantum cellular automata field theories*, Quantum and Beyond, Linnaeus University, Växjö, June 13-16 2016

28. *La realtà fisica, mon beau souci.*, La realtà senza il realismo. Questioni di ontologia fra fisica e filosofia, Istituto Lombardo Accademia di scienze e lettere, Milano, June 7 2016
29. *Quantum cellular automata and the electromagnetic field*, Journées Informatique Quantique, Geometry in Quantum Computation, Université Aix-Marseille, April 4-5 2016
30. *Quantum Cellular automata for quantum field theory*, workshop on Causality in Quantum Mechanics, Bellairs Research Institute, Barbados, March 10-17 2016
31. *A-temporal quantum computations*, Workshop on Time in Physics, ETH, Zurich, September 7-11 2015
32. *Mechanics from principles: free quantum field theory*, Quantum Gravity Theory and Phenomenology, Università La Sapienza, Rome, July 20-23 2015
33. *Quantum cellular automata and free quantum fields*, Quantum Theory: from Foundations to Technologies, Linnaeus University, Växjö, Sweden, June 8-11 2015
34. *Quantum Cellular Automata and the Theory of Light*, EMN Meeting on Quantum Technology, Beijing, April 14-17 2015
35. *Fermionic Cellular Automata and Quantum Fields*, VI Nagoya Winter Workshop on Quantum Information, Measurement and Foundations, Nagoya, Japan, March 9-13 2015
36. *Quantum Cellular Automata and free Quantum Fields*, Workshop on Quantum Metrology, Interaction and Causal Structure 2014, Tsinghua University, Beijing, December 1-5 2014
37. *Quantum Cellular Automata and free Quantum Fields*, Conceptual and Technical Challenges for Quantum Gravity 2014, Rome, September 8-12 2014
38. *Quantum Cellular Automata and Quantum Field Theory*, 12th Biennial International Quantum Structures Association Meeting, June 23-27 2014
39. *Fermionic computation, quantum cellular automata and Maxwell's equations*, 46th Symposium on Mathematical Physics, Torun, Poland, June 15-17 2014
40. *Quantum cellular automata and the electromagnetic field*, Quantum Theory: from Problems to Advances, Linnaeus University, Växjö, Sweden, June 9-12 2014
41. *Fermions and entanglement*, V Nagoya Winter Workshop on Quantum Information, Measurement and Foundations, March 4 2014
42. *Complementarity in operational probabilistic theories*, Workshop on Incompatible Quantum Measurements, TUM, Munich, September 11 2013
43. *Locality, causality and determinism of physical theories in the light of information processing*, Workshop on Physics and Information 2013, Institut Henry Poincaré, Paris, April 9 2013
44. *3-d Quantum cellular automata and Dirac's equation*, IV Nagoya Winter Workshop on Quantum Information, Measurement and Foundations, Nagoya, Japan, February 18 2013

45. *The informational approach to quantum theory: probabilistic theories, quantum principles, and hidden variable models*, Open Problems in Quantum Mechanics, Laboratori Nazionali di Frascati, June 21 2012
46. *Realistic models for probabilistic theories with spookiness and steering?*, III Nagoya Winter Workshop on Quantum Information, Measurement, and Foundations, Nagoya, Japan, February 15 2012
47. *Causality, Locality, and Spooky Action at a Distance*, Quantum Foundations in the Light of Quantum Information III, CRM, Montreal, December 6 2011
48. *Informational axioms for quantum theory*, Foundations of Probability and Physics, Linnaeus University, Växjö, June 13-17 2011
49. *From information processing to Quantum Theory*, 8th CEQUIP Workshop, Znojmo, Czech Republic, June 1-4 2011
50. *Quantum Theory as a Theory of Information Processing*, Conceptual Foundations and Foils for Quantum Information Processing, Perimeter Institute for Theoretical Physics, Waterloo, Canada, May 9-13 2011
51. *Informational Axioms for Quantum Theory*, Problemi Attuali di Fisica Teorica XVII, Vietri sul Mare, Italy, April 15-21 2011
52. *Informational Axioms for Quantum Theory*, Nagoya Winter Workshop on Quantum Information, Measurement, and Foundations, Nagoya, Japan, February 14-18 2011
53. *Higher-order functions in Quantum Theory*, 16th Conference of the International Linear Algebra Society, Pisa, Italy, June 21-25 2010
54. *Switching Boxes in Operational Theories*, Nagoya Winter Workshop on Quantum Information, Measurement, and Foundations, Nagoya, Japan, February 18-24 2010
55. *Quantum Combs for Learning, Computing and Cryptography*, Cambridge Summer Workshop on Quantum Information, Cambridge, UK, July 6th 2009
56. *Estimation and discrimination of quantum networks*, DEX-SMI Workshop on Quantum Statistical Inference, National Institute of Informatics, Tokyo, March 2-4 2009
57. *Quantum combs: a complete framework for quantum networks*, 40th Symposium on Mathematical Physics, University of Torun, Torun, June 25-28, 2008
58. *Quantum supermaps: multiport access devices*, 28th Conference on Quantum Probability and Related Topics, CIMAT-Guanajuato Guanajuato, Mexico, September 2nd-8th, 2007
59. *Applications of the group $SU(1,1)$ for quantum computation and tomography*, National Institute of Informatics, Tokyo, March 15 2007
60. *On the impossibility of stretching a quantum spatial vector*, III Feynman Festival, University of Maryland, College Park, USA, August 25-29 2006
61. *Superbroadcasting of continuous variables mixed states*, XI International Conference on Quantum Optics, Technology Symposium, Belarus Hotel, Minsk, Belarus, May 26-31 2006

62. *Programming quantum devices*, COE-Kakenhi Workshop on Quantum Information Theory and Quantum Statistical Inference, University of Tokyo, Tokyo, Japan, November 17-18 2005
63. *Programmable Quantum Detectors*, II Feynman Festival, University of Maryland, College Park, USA, August 20-25 2004

INVITED SEMINARS

1. *Information-theoretical axioms for quantum theory—the role of purification*, Paris, Sorbonne University, February 29th 2024
2. On the difference between causal influence and signalling, ICTQT Gdansk, July 3rd 2023
3. *Causal influence in operational probabilistic theories*, York center for Quantum Technologies, QuFITs series (online), October 20th 2020
4. *Fermionic Cellular automata*, Turku, February 7 2019
5. *Operational Probabilistic Theories*, Turku, February 6 2019
6. *Higher-order quantum computations and causal structures*, Turku, February 4 2019
7. *Higher-order quantum computations and causal structures*, Perimeter Institute, November 21 2017
8. *Operational probabilistic theories, cellular automata, and the foundations of quantum field theory*, Quantum Causal Structures intermediate workshop Oxford, June 16 2018
9. *Understanding quantum field theory through quantum cellular automata: interactions*, Causal Quantum Structures Kick-off Meeting, IQOQI Vienna, April 10 2017
10. *Teoria quantistica di campo da principi primi*, Istituto Lombardo Accademia di Scienze e Lettere, Milano, May 4 2017
11. *Higher-order quantum computations*, University of Vienna, February 4 2016
12. *Fermionic Cellular Automata and Quantum Fields*, Quantum Meeting, Tsinghua University, Beijing April 15 2015
13. *Entanglement in Fermionic Quantum Theory*, Tsinghua University, Beijing, November 2013
14. *Information processing axioms for Quantum Theory*, CQT, Singapore, November 14 2011
15. *Quantum theory from information processing axioms*, Turku University, October 17 2011
16. *A set of operational axioms for Quantum Mechanics*, RCQI Seminar, Institute of Physics, Slovak Academy of Sciences, Bratislava, June 6th 2010
17. *Switching boxes' connections in operational theories and its consequence on causality*, Perimeter Institute for Theoretical Physics, Waterloo, Canada, February 2nd 2010
18. *Estimation and discrimination of quantum networks*, Quantum Information and Quantum Foundations Seminar, Nagoya University, Japan, March 9th 2009

19. *Quantum combs: a toolbox for quantum networks*, Universidad Complutense, Madrid, December 4 2008
20. *Misure congiunte di osservabili incompatibili e completezza informazionale*, Università degli Studi di Milano, Dipartimento di Fisica, January 26 2007
21. *Improving interferometry by use of entanglement*, Università degli studi di Pavia, Dipartimento di Fisica “A. Volta”, December 4 2001
22. *Stima ottimale in Meccanica Quantistica*, Dipartimento di Matematica, Politecnico di Milano, February 21 2001

BOOKS

- 2017 G. M. D’Ariano, G. Chiribella, P. Perinotti, *Quantum theory from first principles: an informational approach*, Cambridge University Press

Book chapters

- 2023 P. Perinotti, A. Tosini, L. Vaglini, *Shannon theory for quantum systems and beyond: information compression for fermions*, in: Plotnitsky, A., Haven, E. (eds.) *The Quantum-Like Revolution*. Springer, Cham
- 2020 G. M. D’Ariano and P. Perinotti (eds.), *Quantum information and foundations*, Special issue of *Entropy*, MDPI
- 2016 G. Chiribella, G. M. D’Ariano, P. Perinotti, *Quantum from principles*, in *Quantum Theory: Informational Foundations and Foils*, G. Chiribella and R. Spekkens eds., Springer

Teaching

COURSES

- 2022-present *Quantum Mechanics*, bachelor course in physics at University of Pavia
- 2012-present *Theoretical Physics of Information*, master course in physics at University of Pavia
- 2020-2022 *Statistical Mechanics*, bachelor course in physics at University of Pavia
- 2015-2021 *Quantum Mechanics: exercise module*, bachelor course in physics at University of Pavia
- 2016-2020 *Mathematical Methods for Theoretical Physics*, master course in Physics at University of Pavia
- 2018-2019 *General Physics II*, bachelor course in chemistry at University of Pavia
- 2009-2010 *General Physics—exercises*, bachelor course in biology at University of Pavia
- 2001-2002 *Pre-course for Mathematical Analysis* for 1st year physics students at University of Milano
- 2001-2002 *Experimental physics—practical lectures* course in Mechanical and Air and Space Engineering at Politecnico di Milano

THESIS SUPERVISION

PhD

- 2023-present A. Pizzamiglio
- 2022-present L. S. Trezzini
- 2022-present D. Rolino

- 2019-2023 M. Lugli, *One-dimensional Cellular Automata in Quantum and Fermionic Theories*
 2019-2023 L. Vaglini, *Towards a generalised Shannon theory: information content of a source*

Co-supervisor of 5 PhD theses

MSc

- 2024 G. Russo, *Two interacting spins driven out of equilibrium and in presence of dissipation*
 (Erasmus traineeship, co-supervision of Alberto Rosso, Université Paris-Saclay)
 2024 S. Rota, *Perturbative solution of the Thirring quantum cellular automaton*
 2023 A. Pizzamiglio, *Index Theory for multi-dimensional qubit cellular automata*
 (Bicocca University, Milano, co-supervised with A. Zaffaroni)
 2022 D. Rolino *A classical theory with incompatible measurements*
 2022 L. S. Trezzini, *Procedura di Coarse Graining per Automi Cellulari Quantistici*
 (Trieste University, co-supervised with A. Bassi)
 2021 E. Centofanti, *Local isotropic number preserving interaction in discrete time Dirac quantum cellular automata*
 2019 M. Lugli, *State Discrimination with local Resources in the Fermionic Theory*
 2017 A. Olivo, *Optimization of Linear Optical Bell Measurements for Quantum Position Verification*
 (Erasmus traineeship, co-supervision of Frédéric Grosshans, CNRS Paris)
 2017 L. Poggiali, *Unitarity conditions for homogeneous Fermionic Cellular Automata*

Co-supervisor of 11 master theses

BSc

- 2023 A. Casadei, *Una recente proposta di definizione e quantificazione dell'influenza causale quantistica*
 2023 L. E. Nugnes, *Matrix Product States ed il Density Matrix Renormalization Group*
 2023 A. Vercesi, *Relational Quantum Mechanics and its relation with the standard interpretation*
 2022 A. Testa, *Development of quantum contextuality from theoretical and statistical points of view*
 2022 T. Montani Fargna, *Termodinamica Quantistica. Analisi del comportamento delle più piccole macchine termiche*
 2022 M. C. Corda, *Incompatible measurements in General Probabilistic Theories*
 2021 M. Zanetti, *Area Laws: al confine tra meccanica statistica e informazione quantistica*
 2021 S. Rota, *Simulare sistemi fermionici con qubits: rappresentazioni e loro costo computazionale*
 2021 S. Troffa, *Quantum contextuality from an algebraic and geometric perspective*
 2020 D. Rolino, *Analysis of a new measurement paradox of quantum mechanics*
 2020 A. Mondini, *Principio di Landauer in sistemi quantistici finito-dimensionali*
 2019 S.-N. Paicu, *On a recent approach to thermalization and thermal equilibrium from a quantum perspective (Un recente approccio alla termalizzazione ed all'equilibrio termico da un punto di vista quantistico)*
 2019 F. M. Quetti *Disuguaglianze di Leggett Gargg e correlazioni temporali*
 2019 L. Rapella, *Antidistinguishable quantum states and communication of partial ignorance*
 2019 E. Centofanti, *Quantum State Discrimination by Local Operations and Classical Communication*
 2019 L. Battezzatore, *Analisi termodinamica del processo di misurazione in alcune interpretazioni della meccanica quantistica*
 2019 D. Sina, *Measurement of Work in Quantum Thermodynamics: an Approach Based on Weak Values*

- 2018 M. Lacchini, *Spekkens' toy theory as an operational probabilistic theory: a preliminary analysis*
 2018 F. Zagaria, *An introduction to quantum statistics on graphs*
 2017 M. Rossati *Evidenza della radiazione di Hawking e del suo entanglement in un analogo acustico di buco nero in condensato di Bose-Einstein*
 2017 L. Teodori *A link between thermodynamics and quantum information using Lieb and Yngvason approach*
 2015 A. Olivo, *Quantum tagging: position verification in quantum information*
 2014 A. G. Orellana, *Nozioni di entropia nelle teorie probabilistiche operazionali*
 2014 M. Ghio, *Il teorema di de Finetti in teoria quantistica dell'informazione*
 2013 F. Arzani, *Un Approccio Informatzionale alla Termodinamica Quantistica Fuori dal Regime di von Neumann*

IUSS (University Institute for Superior Studies)

- 2019 L. Giannelli, *Non-contextuality Inequalities from Kochen-Specker Theorem and Contextual Advantage for State Discrimination*

Service to the profession

EDITORIAL ACTIVITY

- 2020 Guest editor for a special issue of *Entropy*, entitled *Quantum information and foundations*
 2020-present Member of the editorial board of *Entropy*
 2000-present Referee for various international journals, among which *Quantum*, *Nature*, *Physical Review X*, *Physical Review Letters*, *Physical Review*, *Physics Letters*, *EPL*, *New Journal of Physics*, *Foundations of Physics*

EVENT ORGANISATION

- 2023 Organizing committee of the 15th biennial meeting of the International Quantum Structures Association
 2020 Programme committee of QPL (Quantum Physics and Logic)
 2018 Programme committee of QPL
 2017 Programme committee of QPL
 2005-2006 Local organising committee of *Workshop on quantum quantum information and foundations of quantum mechanics*, University of Pavia.
 2004-2005 Local organising committee of *Workshop in quantum measurements and operations for cryptography and information processing*, University of Pavia
 2003 Local organising committee of *Workshop on quantum information processing and quantum communications*, University of Pavia