

Dr. Petros Wallden

CONTACT INFORMATION	School of Informatics, University of Edinburgh , 10 Crichton Street, EH8 9AB, Edinburgh, UK petros.wallden@ed.ac.uk, http://pwallden.gr/
RESEARCH INTERESTS	Certification of Quantum Technologies: Methods to benchmark/certify/verify the performance of applications of realistic quantum technologies Quantum Security: (i) Quantum Crypto: Quantum digital signatures, quantum RNG, blind quantum computing, multiparty quantum computing. Modelling and treatment of realistic constraints (ii) Quantum-Enhanced Classical Crypto: Quantum techniques to boost modern crypto protocols such as e-voting, blockchain, secure cloud computing, FHE, post-quantum crypto Quantum Computation: Quantum algorithms (quantum simulation, quantum-advantage, etc). Modelling and treatment of realistic constraints Quantumness as resource: Explore fundamental quantum properties (non-locality, steering, contextuality, optimal measurements, uncertainty) for quantum information tasks (e.g. for <i>device-independent</i> privacy). Robustness of results in the presence of realistic constraints
CURRENT POSITION	Research Associate and Lecturing Quantum Computation , Since Sept. 2014 University of Edinburgh , Edinburgh, UK
EDUCATION	PhD in Theoretical Physics , September 2006 Imperial College , London, UK Master of Advanced Study in Mathematics , September 2003 University of Cambridge , Cambridge, UK BSc in Physics with Theoretical Physics , June 2002 Imperial College , London, UK
PAST POSITIONS	Jul. 2013 - Sept. 2014 Research Associate in Quantum Cryptography at Heriot-Watt University (Edinburgh, UK) Oct. 2009 - Feb. 2013 Adjunct Lecturer at Science Department, Technological Educational Institute (TEI) of Chalkida (Chalkida, Greece) Oct. 2009 - Sept. 2010 Postdoctoral Fellow in Theoretical Physics at Department of Physics, University of Athens (Athens, Greece) Oct. 2008 - Sept. 2009 Military service (compulsory) in Greece, Unit of Electronic Warfare Oct. 2006 - Sept. 2008 Postdoctoral Fellow at Raman Research Institute (Bangalore, India)
GRANTS & VISITING POSITIONS	Funded PhD studentship , EPSRC Doctoral Training Partnership (CoI); Student (Ellen Derbyshire) started 10/2017 Title: Demonstrating Quantum Speed-up on the NQIT machine Short Term Scientific Mission (PI), European COST Action MP1006, Mar. 2013 - Apr. 2013 Title: Non-separability and quantum measure For collaboration with Prof. Fay Dowker at Imperial College Personal Fellowship for Postdoctoral Research (PI), 2009 - 2010 State Scholarships Foundation (I.K.Y.) of Greece Visiting Researcher at Institute for Quantum Computing, (Waterloo, Canada): Aug. 2014 Collaboration with Prof. Norbert Lütkenhaus

Visiting Researcher at Perimeter Institute (Waterloo, Canada): May 2013 & Nov. - Dec. 2007
Collaboration with Prof. Rafael Sorkin

Visiting Researcher at Imperial College: Jun. - Jul. 2007 & May 2008
“Royal Society International Joint Project 2006-R2” of British Royal Society for collaboration of Imperial College and Raman Research Institute

Visiting Researcher at the Euler Mathematical Institute: Nov. - Dec. 2004
“Tete-a-tete in St. Petersburg”, Euler Mathematical Institute of the Russian Academy of Science

Personal Scholarship for PhD research 2003 - 2005
“A.G. Leventis Foundation”

ORGANISER,
MEMBER,
REFEREE

Management Committee Member: European program, COST Action MP1006, 2012 - 2015

Vice-Chair of Working Group: “Quantum Theory meets Relativity” of COST Action MP1006

Organiser of workshop: “Quantum Information Technologies: Challenges and Applications” (12 speakers, 55 participants), University of Edinburgh, October 2017

Organiser of workshop: “NQIT Theory Workshop” (7 speakers, 30 participants), University of Oxford, January 2017

Organiser of workshop: “Quantum Information in Scotland” part of QUISCO (6 speakers, 20 participants), University of Edinburgh, December 2014

Organiser of international workshop “Foundations of Quantum Mechanics and Quantum Gravity” (15 speakers, 48 participants), Imperial College, London, April 2014

Organiser of international workshop: “Foundations of Quantum Mechanics and Relativistic Spacetime” (19 speakers, 47 participants), Athens, September 2012

Organiser of workshop: “Fundamental Problems in Quantum Physics” (13 speakers, 35 participants), NCSR “Demokritos”, Athens, March 2012

Member: (i) Quantum Information in Scotland (QUISCO) network (since 2013), (ii) Association, Computability in Europe (CiE) (since 2008), (iii) Hellenic Society on Relativity, Gravitation & Cosmology (H.S.R.G.C.) (since 2008)

Program Committee ACISP: 21st and 22nd Australasian Conference on Information Security and Privacy

Referee: for ten journals and top conferences e.g. “Phys. Rev. Lett.”, “Phys. Rev. A.”, “New J. Phys.”, “Jour. Math. Phys.”, “QIP2017”, “QCrypt2017”, “EuroCrypt 2017”

TEACHING

Main Lecturer: Introduction to Quantum Computing (taken by 4th year undergraduate and masters students), at University of Edinburgh, 2014 - 2017

Main Lecturer: Technological Educational Institute (TEI) of Chalkida, 2009 - 2013
In Mathematics (five different courses), Physics (four different courses) and Computing (two courses)

Teaching Assistant: Mathematics and Physics under Profs J.J. Halliwell, P. Torok and T. Horbury, Imperial College 2003 - 2006

SUPERVISIONS

Four PhD students: Co-supervise two PhD student at University of Edinburgh (since 2014 and 2017) and as external supervisor two PhD students at Heriot-Watt (one graduated 10/2017 the other since 2015)

Six Project/MInf/MEng students: Co-supervised five Project/MInf students at University of Edinburgh and one MEng student at National and Technical University of Athens (NTUA)

CONFERENCES &
INVITED TALKS

34 talks at International Conferences (8 as invited speaker) e.g. : Invited speaker at: “Trustworthy Quantum Information 2017”, Paris, June 217; “Continuous variables & relativistic quantum information” NFP2017 Crete, August 2017; “Physics and Information”, Paris, June 2015.

11 invited talks at Universities & Research Institutes
e.g.: York, November 2015; Oxford, February 2015; Cambridge, May 2014.

In all the papers, except papers [28 - 31, 33 - 38] and [12 - 14], the authors are in alphabetical order. The total number of **citations** is **544**, **H-index 16** (Google Scholar December 2017). Six selected publications are in italics.

Journals papers: refereed (in reverse chronological order)

40. E. Kashefi and P. Wallden, Garbled Quantum Computation, *Cryptography* **1** (1), 6 (2017).
39. E. Kashefi and P. Wallden, Optimised resource construction for verifiable quantum computation, *J. Phys. A: Math. Theor.* **50** 145306 (2017).
38. *A. Gheorghiu, P. Wallden and E. Kashefi, Rigidity of quantum steering and one-sided device-independent verifiable quantum computation, *New J. Phys.* **19** 023043 (2017) – (18 citations).*
37. I. Vergheese Puthoor, R. Amiri, P. Wallden, M. Curty and E. Andersson, Measurement-device-independent quantum digital signatures, *Phys. Rev. A* **94**, 022328 (2016).
36. *C. Croal, C. Peuntinger, B. Heim, I. Khan, C. Marquardt, G. Leuchs, P. Wallden, E. Andersson and N. Korolkova, Free-space quantum signatures using heterodyne detection, *Phys. Rev. Lett.* **117**, 100503 (2016) – (16 citations).*
35. R. Amiri, P. Wallden, A. Kent, E. Andersson, Secure quantum signatures using insecure quantum channels, *Phys. Rev. A* **93**, 032325 (2016).
34. R.J. Donaldson, R.J. Collins, K. Kleczkowska, R. Amiri, P. Wallden, V. Dunjko, J. Jeffers, E. Andersson, G.S. Buller, Experimental demonstration of kilometer-range quantum digital signatures, *Phys. Rev. A* **93**, 012329 (2016). Was selected as Editor’s suggestion.
33. J.-M. Arrazola, P. Wallden, E. Andersson, Multiparty Quantum Signature Schemes, *Quantum Inf. Comput.* **6**, 0435 (2016).
32. *A. Gheorghiu, E. Kashefi and P. Wallden, Robustness and device independence of verifiable blind quantum computing, *New J. Phys.* **17**, 083040 (2015) – (31 citations).*
31. P. Wallden, V. Dunjko, A. Kent and E. Andersson, Quantum digital signatures with quantum key distribution components, *Phys. Rev. A* **91**, 042304 (2015).
30. *R. J. Collins, R. J. Donaldson, V. Dunjko, P. Wallden, P. J. Clarke, E. Andersson, J. Jeffers, G. S. Buller, Realization of quantum digital signatures without the requirement of quantum memory, *Phys. Rev. Lett.* **113**, 040502 (2014). Featured in *Physics &* was selected as Editor’s Suggestion – (60 citations).*
29. *V. Dunjko, P. Wallden and E. Andersson, Quantum Digital Signatures without quantum memory, *Phys. Rev. Lett.* **112**, 040502 (2014) – (53 citations).*
28. P. Wallden, V. Dunjko and E. Andersson, Minimum-cost quantum measurements for quantum information, *J. Phys A: Math. Theor.* **47** 125303 (2014).
27. *F. Dowker, J. Henson and P. Wallden, A histories perspective on characterising quantum non-locality, *New J. Phys.* **16**, 033033 (2014) – (21 citations).*
26. P. Wallden, Contrary Inferences in Consistent Histories and a Set Selection Criterion, *Found. Phys.* **44**, 1195 (2014).
25. P. Wallden, Distinguishing initial state-vectors from each other in histories formulations and the PBR argument, *Found. Phys.* **43**, 1502 (2013).
24. S. Surya and P. Wallden, Quantum Covers in Quantum Measure Theory, *Found. Phys.* **40**, 585 (2010).
23. Y. Ghazi-Tabatabai and P. Wallden, Dynamics and predictions in the co-event interpretation, *J. Phys. A: Math. Theor.* **42**, 235303, (2009).
22. D. Rideout and P. Wallden, Spacelike distance from discrete causal order, *Class. Quant. Grav.* **26**, 155013 (2009).
21. P. Wallden, Spacetime Coarse Grainings and the Problem of Time in the Decoherent Histories Approach to Quantum Theory, *Int. J. Theor. Phys.* **47**, 1512 (2008).

20. I. Raptis, P. Wallden and R.R. Zapatrin, Decomposition of pure states of quantum register, *Europ. Phys. Jour. D* **41**, 185 (2007).
19. J.J. Halliwell and P. Wallden, Invariant Class Operators in the Decoherent Histories Analysis of Timeless Quantum Theories, *Phys. Rev. D* **73**, 024011 (2006).
18. I. Raptis, P. Wallden and R.R. Zapatrin Spacetime, Topology from the tomographic histories approach: Case II, *Int. J. Theor. Phys.* **45**, 2350 (2006).
17. I. Raptis, P. Wallden and R.R. Zapatrin, Spacetime Topology from the tomographic histories approach I: Non-Relativistic Case, *Int. J. Theor. Phys.* **45**, 1589 (2006).

Papers appearing as Book Chapter

16. K. Clements, F. Dowker and P. Wallden, Physical Logic, pages 47-61, “The Incomputable - Journeys Beyond the Turing Barrier” (editors S. Barry Cooper and Mariya I. Soskova), Springer book series “Theory and Applications of Computability” (2017).

Papers: Currently under review

15. E. Kashefi, L. Music and P. Wallden, Cut-and-choose technique for quantum two-party computation, preprint arXiv:1703.03754 (2017).
14. R. Amiri, A. Abidin, P. Wallden and E. Andersson, Unconditionally Secure Signatures, cryptology ePrint IACR 2016/739 (2016).

Conference papers: refereed (in reverse chronological order)

13. A. Gheorghiu, P. Wallden, and E. Kashefi, Rigidity of quantum steering and one-sided device-independent verifiable quantum computation, in *Quantum Information and Measurement (QIM) 2017*, OSA Technical Digest (online) (Optical Society of America, 2017), paper QW3B.5.
12. R. J. Collins, R. J. Donaldson, V. Dunjko, P. Wallden, P. J. Clarke, E. Andersson, J. Jeffers, G. S. Buller, An in fiber experimental approach to photonic quantum digital signatures that does not require quantum memory, *Proc. SPIE, Emerging Technologies in Security and Defence II and Quantum-Physics-based Information Security III*, 9254 (2014).
11. P. Wallden The coevents formulation of quantum theory, *J. Phys.: Conf. Ser.* **442**, 012044 (2013).
10. P. Wallden Causal Sets Dynamics: Review & Outlook, *J. Phys.: Conf. Ser.* **453**, 012023 (2013).
9. P. Wallden Reasoning in Quantum Theory: Modus Ponens and the co-event interpretation, *J. Phys.: Conf. Ser.* **306**, 012044 (2011).
8. T. Christodoulakis and P. Wallden The problem of time in quantum cosmology: a decoherent histories view, *J. Phys.: Conf. Ser.* **283**, 012041 (2011).
7. P. Wallden Causal Sets: Quantum gravity from a fundamentally discrete spacetime, *J. Phys.: Conf. Ser.* **222**, 012053 (2010).
6. D. Rideout and P. Wallden Emergence of spatial structure from causal sets, *J. Phys.: Conf. Ser.* **174**, 012017 (2009).
5. Y. Ghazi-Tabatabai and P. Wallden The Emergence of Probabilities in Anhomomorphic Logic, *J. Phys.: Conf. Ser.* **174**, 012054 (2009).
4. D. Rideout, P. Wallden Emergent Continuum Spacetime from a Random, Discrete, Partial Order, *J. Phys.: Conf. Ser.* **189**, 012045 (2009).
3. I. Raptis, P. Wallden and R.R. Zapatrin, Algebraic Approach to ‘Quantum Spacetime Geometry’, *Proceedings of the Eleventh Marcel Grossmann Meeting on General Relativity*, (ed.) H. Kleinert, R.T. Jantzen and R. Ruffini, World Scientific, p. 2806 (2008).
2. P. Wallden Quantum Zeno Effect in the Decoherent Histories, P. Wallden, *J. Phys.: Conf. Ser.* **67**, 012043 (2007).
1. P. Wallden Effective Topology from Spacetime Tomography, P. Wallden, *J. Phys.: Conf. Ser.* **68**, 012028 (2007).