Andreas Winter – Curriculum Vitae (1 February 2013)

Personal details

Birth date:	14 June 1971 (Mühldorf am Inn, Germany)
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Present and previous appointments

since 10/2012	ICREA Research Professor, affiliated with Universitat Autònoma de Barcelona.
10/2006-9/2012	Professor of the Physics of Information, Department of Mathematics, University of Bristol, U.K. (2008-2012 in addition Visiting Research Professor with the Centre for Quantum Technologies, National University of Singapore.)
9/2003-9/2006	Lecturer in Mathematics, Department of Mathematics, University of Bristol, U.K.
4/2001-8/2003	Research Associate with Prof. Richard Jozsa, Department of Computer Science, University of Bristol, U.K.
7/1999-3/2001	Research Associate with Prof. Rudolf Ahlswede, Department of Mathematics, University of Bielefeld, Germany.

Academic qualifications

1/7/1999	PhD (Dr. math.) from University of Bielefeld, Germany. Thesis: *Coding Theorems of Quantum Information Theory.* Advisor: Prof. Rudolf Ahlswede.
8/1997	Diploma (Dipl. math.) from Freie Universität Berlin, Germany.
4/1994-8/1997	Undergraduate studies of mathematics at Freie Universität Berlin, Germany.
10/1991-3/1994	Undergraduate studies of mathematics at Universität Konstanz, Germany.

Teaching

At UAB I am currently not involved in teaching, my position being defined as a research appointment. However, at the Department of Mathematics in Bristol I taught *Advanced Optimisation* in 2003 and 2004. Furthermore, I designed a course *Information Theory* and delivered it from 2006, first fully then in cooperation with other lecturers. I was participating in the Taught Course Centre, a collaboration to provide graduate studies between the Universities of Bristol, Bath, Warwick, Oxford and Imperial College, by covering part of a unit *Quantum Information and Computing*. I supervise(d) 5 PhD students: 2 have completed, 3 are still in progress.

Grants and prizes

German Research Council Emmy Noether fellowship *Information and Quantum Physics*	2001-2003	(awarded but not taken up)
University of Bristol Research Fellowship *Transmission of partial quantum information*	2005-2006	£10,000
U.K. EPSRC Advanced Research Fellowship *Random and Nonrandom Coding for Quantum Information*	2006-2011	£450,000
EC Marie Curie Int'l Incoming Fellowship for Aram Harrow (from MIT) *Applications of Schur Transform to Quantum Information*	2006-2008	€150,000
Royal Society International Joint Project *Noise as a Resource in Cryptography*	2006-2008	£8,000
Wolfson Research Merit Award *Mathematical Studies in the Physics of Information*	2007-2012	£100,000
Philip Leverhulme Prize *Quantum Information*	2009-2011	£70,000
EC Marie Curie Int'l Incoming Fellowship for Milan Mosonyi (from CQT Singapore) *Quantum Theory and Statistics*	2011-2013	€150,000
ERC Advanced Grant "IRQUAT" *Information and Randomness in Quantum Theory*	2011-2016	€1,440,119
Participant in EC collaborative network "RESQ" *Resources in Quantum Information Processing*	2003-2006	€140,000
Participant in U.K. EPSRC "QIP IRC" (Large U.K.-wide collaboration; Bristol group with separate theory grant)	2004-2010	£525,000
Participant and node leader in EC integrated project "QAP" *Qubit Applications*	2006-2010	€150,000
Participant in EC integrated project "QESSENCE" *Quantum Interfaces, Sensors and Communication based on Entanglement*	2010-2013	€75,000
Participant in EC STREP project "QICS" *Foundational Structures for Quantum Information and Computation*	2007-2010	€150,000
Participant in EC STREP project "QCS" *Quantum Computer Science*	2010-2013	€150,000
Participant in Templeton Foundation project (Bristol) *Why is Nature Not More Non-local?*	2011-2013	£145,000
Whitehead Prize of the London Mathematical Society	2012	

Other indicators of academic leadership

I am considered one of the internationally leading figures in mathematical/theoretical quantum information science, and my scientific advice is being consistently sought. As such, I was involved in the organisation and in the programme committees of numerous conferences (see below); I have been consulted regularly since 2005 by the U.K. EPSRC, the European Commission, and Austrian, Canadian, German and Japanese funding bodies on future research directions and grant proposal evaluation.

2008-2012 my role in shaping the then newly founded Centre for Quantum Technologies (CQT) in Singapore (`http://www.quantumlah.org`) was being honoured with a visiting research professorship there. As a principal investigator within the CQT I commanded a research budget of ca. S$ 2M, to manage a group of ca. five RAs, aided by a Senior RA.

In that function, and also representing Bristol, I was involved in a "Collaborative Research Group" for *Mathematics of Quantum Information* of the Pacific Institute for Mathematical Sciences (PIMS), led by Barry Sanders (Calgary).

Invited lectures at international conferences

From the beginning of my career I have been invited to international conferences to speak about my work. Every year I accept around 6 such invitations, from specialist workshops to major international events. In

the following I list only the most visible such invitations.

- Invited speaker at the 2nd "ESF Quantum Information Theory Conference", Gdańsk, 2001.
- Invited speaker at "Quantum Information Processing" 2002, IBM, Yorktown Heights, NY.
- Invited speaker at "Quantum Information Processing" 2003, MSRI, Berkeley.
- Invited speaker at the "Von Neumann centennial conference", Alfred Rényi Institute, Budapest, 2003.
- Invited speaker at "Quantum Information Processing" 2004, Perimeter Institute, Waterloo.
- Invited speaker at "Quantum Information Processing" 2005, MIT, Cambridge MA.
- Invited speaker at "Asian Quantum Information Science" 2005, Tokyo.
- Plenary speaker at "13th International Congress of Mathematical Physics", Rio de Janeiro, 2006.
- Invited speaker at "Quantum Information Processing" 2007, University of Queensland, Brisbane.
- Invited speaker at "Phenomena in High Dimension", Sevilla, 2008.
- Invited speaker at "5th European Congress of Mathematics", Amsterdam, 2008.
- Invited speaker at "Asian Quantum Information Science" 2011, Busan (Korea).
- Invited participant at extended topical programmes on quantum information: MSRI (Berkeley), Isaac Newton Institute (Cambridge), Institut Henri Poincaré (Paris), Fields Institute (Toronto), Centro de Ciencias "Pedro Pascual" (Benasque) and KITP (Santa Barbara).

Organisation of conferences

- Member of the Steering Committee of the "Quantum Information Processing" conference series, 2007-2012. `http://qipworkshop.org/`
- Member of the Steering Committee of the "Central European Quantum Information Processing" conference series, since 2011. `http://ceqip.eu/`
- Member of technical programme committee of the "Theory of Quantum Computing" conference 2011.
- Member of technical programme committee of the "Quantum Information Processing" conference 2006 and 2007.
- Member of technical programme committee of the "Asian Quantum Information Science" conference 2005, 2006, 2008, 2009, 2010, 2012.
- Co-chair (with Emina Soljanin) of the technical programme committee of the Information Theory Workshop of the Information Theory Society, Porto, 5-9 May 2008. `http://www.dcc.fc.up.pt/itw08/`
- Co-organiser (with Matthias Christandl and Heinz Siedentopp) of a topical semester "Complex Quantum Systems" at the Institute for Mathematical Sciences, National University of Singapore, 15 February-27 March 2010.
  `http://www.ims.nus.edu.sg/Programs/010quantum/`
- Co-organiser (with Alexander Holevo, Mary-Beth Ruskai, Erling Størmer and Michael Wolf) of the topical semester "Quantum Information Theory" at Institut Mittag-Leffler, Stockholm, 1 September-15 December 2010.
  `http://www.mittag-leffler.se/programs/future/1011f/`

- Organiser of the 14th "Quantum Information Processing" conference, 10-14 January 2011, Singapore. `http://qip2011.quantumlah.org/`
- Organiser (together with Richard Jozsa, Noah Linden and Peter Shor) of the topical semester "Mathematical Challenges of Quantum Information" at the Isaac Newton Institute, Cambridge, 27 August-20 December 2013.

Editorial activity

- Associate editor for Quantum Information with IEEE Trans. Information Theory, 2005-2008.
- Editorial board member of Journal of Mathematical Physics, since 4/2011.
- Editorial board member of Communications in Mathematical Physics, since 12/2012.
- Regular reviewer for leading journals: Physical Review, Nature, Nature Physics, Commun. Math. Phys., IEEE Trans. Inf. Theory, J. Math. Phys., Proc. Royal Society, Quantum Inf. Comput.

Research statement

Quantum Shannon theory (beginning with B. Schumachers work in the early 1990s) asks about the ultimate building blocks and physical limitations of information processing; it is concerned with operational questions of the type "how to communicate most efficiently through a noisy channel?", and abstractions thereof. I have contributed fundamentally to this field, by focusing on the mathematical structures behind these information coding problems, and I am especially fascinated by probabilistic and geometric methods applied to information. Indeed, the development of mathematical techniques is becoming of paramount importance to quantum information science, and my own work contributes to this development in three ways. First, through the creation of new mathematical tools and concepts to approach information theory problems; in the past, this has ranged from combinatorial ideas, to new large deviation bounds for operator valued random variables, and to new inequalities for the quantum entropy, including entropic uncertainty relations. Secondly, by importing tools from other disciplines - an example is the extremely fruitful use of probabilistic-geometric measure concentration in quantum coding and in the construction of exotic quantum states, most recently of quantum channels violating certain so-called additivity conjectures (papers by me and by Hayden, culminating in the recent counterexample by Hastings). Thirdly, by applying the new techniques to other areas, for example in recent work with Linden, Popescu and Short on the foundations of statistical mechanics. In the last few years I and several collaborators have started developing quantum zero-error information theory.

Most significant scientific contributions

1. **Partial quantum information.** In my work on negative quantum information [with M. Horodecki and J. Oppenheim, *Nature* **436**:673-676 (2005) and *Commun. Math. Phys.* **269**:107-136 (2007)], the fundamental new concept of quantum state merging is introduced, giving operational meaning to the sometimes negative values of the quantum conditional entropy. It profoundly changed the community's view of the subjects of quantum error correction, channel coding and capacities. In particular, we showed a deep duality between quantum (distributed) data compression and channel coding, known in different form in classical information theory. This new viewpoint has resulted in a whole series of papers re-organising the foundations of quantum Shannon theory, spearheaded by my work with A. Abeyesinghe, I. Devetak and P. Hayden [*Proc. Roy. Soc. London A* **465**:2537-2563 (2009)].
2. **Information Causality.** With M. Pawłowski *et al.* [*Nature* **461**:1101-1104 (2009)], we put forward the new concept of "information causality" and showed that this principle could explain the quantum limitations on non-local correlations which separate them from the "no-signalling" ones (i.e. the constraints due to Einstein locality). This paper already had significant impact, prompting several other groups to elaborate on the information theory of non-local correlations.

3. **Statistical mechanics.** Together with N. Linden, S. Popescu and A. J. Short, we are attempting to establish the foundations of statistical mechanics on quantum theoretical grounds. Our initial paper on this subject [with S. Popescu and A. J. Short, *Nature Physics* **2**:754-758 (2006)] showed that the equilibrium state consistent with the postulate of equal probabilities can be generically explained by a pure state of system and bath, in the most general of physical situations. It is continued in [N. Linden *et al.*, *Phys. Rev. E* **79**:061103 (2009) and arXiv:0907.1267], and we are currently engaged in carrying out the ambitious "roadmap" laid out in the PRE paper.
4. **Zero-error quantum information.** In collaboration with R. Duan and S. Severini [`arXiv[quant-ph]:1002.2514`], we have not only introduced a quantum generalisation of Lovász' famous ϑ function [IEEE Trans. Inf. Theory **25**(1):1-7 (1979)], and proved that it bounds the zero-error capacity of a quantum channel, but have shown that much of graph theory can be recast in the algebraic language of Hilbert modules and operator systems, motivating the generalisation to *non-commutative graphs*, a theory that is ideally adapted to reason about error-free information transmission via channels, and which we expect to have many further applications, in quantum Shannon theory and combinatorics.
5. **Additivity conjectures.** I initiated much of the conceptual and mathematical progress on the "additivity problem" of quantum communication theory. In work with K. Matsumoto and T. Shimono [*Commun. Math. Phys.* **246**:427-442 (2004)] we provided the first link of the additivity of the so-called Holevo capacity to other additivity conjectures; this was subsequently developed into a full equivalence of several additivity conjectures by Shor [*Commun. Math. Phys.* **246**:453-472 (2004)]. The equivalences were the basis for my recent work [with P. Hayden, *Commun. Math. Phys.* **284**:263-280 (2008); and with T. S. Cubitt *et al.*, *Commun. Math. Phys.* **284**:281-290 (2008)] on counterexamples to a set of stronger additivity properties; the ideas of these papers were essential to Hastings' subsequent disproof of the original additivity conjectures [*Nature Physics* **5**:255-258 (2009)].
6. **Operator-valued random variables.** My paper with R. Ahlswede [*IEEE Trans. Inf. Theory* **48**(3):569-579 (2002)] contains the elements of an original theory of operator valued random variables and their large deviations, developed to solve a specific problem in quantum identification theory. The theory is so beautiful and versatile, that it started having further applications instantly, at first in quantum Shannon theory, then further afield, e.g. a new, shorter and more efficient proof of the Alon-Roichman theorem on random Cayley graphs being expanders [Z. Landau and A. Russell, *Electr. J. Comb.* **11**:62 (2004); D. Christofides and K. Markström, *Rand. Struct. Alg.* **32**(1):88-100 (2007); A. Wigderson and D. Xiao, Proc. FOCS 2005 & 2009], and recently a much simplified approach to matrix completion [E. J. Candes and T. Tao, arXiv:0903.1476; D. Gross *et al.*, arXiv:0909.3304 and arXiv:0910.1879].
7. **Random states.** My paper on generic entanglement [with P. Hayden and D. Leung, *Commun. Math. Phys.* **265**(1):95-117 (2006)], was the very first exploration of a fully quantum version of the probabilistic method, yielding not examples but the existence of states and quantum channels with exotic or even paradoxical properties. Among later applications of this are the above-mentioned ground-breaking results concerning statistical mechanics and the additivity conjectures.
8. **Applications of non-standard entropies.** In my paper with P. Hayden [*Phys. Rev. A* **67**:012326 (2003)] we use Rényi entropies, and more importantly *smoothed* Rényi entropies, for the first time in quantum information theory, to solve a specific problem in entanglement theory. Recently, R. Renner [PhD thesis, ETH Zürich 2005] and his followers have systematically developed this tool as a basis of information theory.
9. **Entropy inequalities.** Finally, inequalities relating quantum entropies are among the fundamental tools in information theory. In my work with N. Linden [*Commun. Math. Phys.* **259**:129-138 (2005)], we provided the first evidence of a new inequality for the von Neumann entropy in more than 30 years since the proof of "strong subadditivity" [E. H. Lieb, M.-B. Ruskai, *J. Math. Phys.* **44**(12):1938-1941 (1973)], by building on my own work regarding the equality conditions of the latter [with P. Hayden, R. Jozsa and D. Petz, *Commun. Math. Phys.* **246**:359-374 (2004)], and bringing to bear information theoretic ideas.
10. **Distrustful cryptography.** In cryptography, my work with A. C. A. Nascimento and H. Imai [*Proc. 9th IMA Intl. Conference on Cryptography and Coding*, LNCS 2898, Springer Verlag, Berlin 2003,

pp. 35-51] has shown that every noisy channel can be used to implement the cryptographic primitive, bit commitment, and indeed we found a simple formula for the precise capacity of committing to a long string. This is the first result of its kind in distrustful cryptography; subsequently we managed to extend this work to a capacity theorem for the more powerful task of oblivious transfer [with A. C. A. Nascimento, *IEEE Trans. Inf. Theory* **54**(6):2572-2581 (2008)].

Publications

My research career in quantum information science spans about 13 years, during which time I wrote more than 110 papers in refereed journals and proceedings, in part as the sole author, but many in collaboration: to-date I have ca. 100 collaborators on papers, including C. H. Bennett, M. and P. Horodecki, R. Jozsa, P. W. Shor, F. Verstraete, etc, but also many younger colleagues, the interaction with whom remains extremely important to me.

1. "Coding theorem and strong converse for quantum channels", IEEE Trans. Inf. Theory **45**(7):2481-2485, 1999.
2. "Another algebraic proof of Bondy's theorem on induced subsets", J. Combin. Theory Ser. A **89**(1):145-147, 2000.
3. (with H. Barnum, P. Hayden and R. Jozsa) "On the reversible extraction of classical information from a quantum source", Proc. Roy. Soc. Lond., Ser. A Math. Phys. Eng. Sci. **457**(2012):2019-2039, 2001.
4. (with S. Massar) "Compression of quantum-measurement operations", Phys. Rev. A **63**:012311, 2001.
5. "On the fidelity of two pure states", J. Phys. A: Math. Gen. **34**(35):7095-7101, 2001.
6. "The capacity of the quantum multiple-access channel", IEEE Trans. Inf. Theory **47**(7):3059-3065, 2001.
7. (with R. Freivalds) "Quantum Finite State Transducers", Proc. of SOFSEM 2001, Piešťany, Slovakia, 24 November-1 December 2001, pp. 233-242, Springer Verlag, Berlin 2001. Full version: e-print `arXiv:quant-ph/0011052`.
8. (with R. Ahlswede) "Strong converse for identification via quantum channels", IEEE Trans. Inf. Theory **48**(3):569-579, 2002. Addendum: ibid. **49**(1):346, 2003.
9. "Scalable programmable quantum gates and a new aspect of the additivity problem for the classical capacity of quantum channels", J. Math. Phys. **43**(9):4341-4352, 2002.
10. (with P. Hayden and R. Jozsa) "Trading quantum for classical resources in quantum data compression", J. Math. Phys. **43**(9):4404-4444, 2002.
11. "The Reverse Shannon Theorem in Classical and Quantum Information Theory: a New Unifying Principle", Proc. ICSF 2002, Waseda University, Tokyo, Japan, 27-28 March 2002, pp. S6.12-17.
12. "Scalable programmable quantum gates and a new aspect of the additivity problem for the classical capacity of quantum channels", Proc. IEEE Symp. Inform. Theory, Lausanne, Switzerland, 1-5 July 2002, p. 70.
13. "Compression of sources of probability distributions and density operators", e-print `arXiv:quant-ph/0208131`, 2002.
14. (with P. Hayden) "Communication cost of entanglement transformations", Phys. Rev. A **67**:012326, 2003.
15. (with M. Hayashi, M. Koashi, K. Matsumoto and F. Morikoshi) "Error exponents for entanglement concentration", J. Phys. A: Math. Gen. **36**(2):527-553, 2003.
16. (with I. Devetak) "Classical data compression with quantum side information", Phys. Rev. A **68**:042301, 2003.
17. (with R. Jozsa, M. Koashi, N. Linden, S. Popescu, S. Presnell and D. Shepherd) "Entanglement cost of generalised measurements", Quantum Inf. Comp. **3**(5):405-422, 2003.
18. (with I. Devetak) "Distilling common randomness from bipartite quantum states", Proc. IEEE Symp. Inform. Theory, Yokohama, Japan, 29 June-4 July 2003, p. 403.
19. (with A. C. A. Nascimento and H. Imai) "Commitment Capacity of Noisy Channels", Proc. 9th IMA Intl. Conference on Cryptography and Coding, Cirencester, U.K., 16-18 December 2003, LNCS 2898, Springer Verlag, Berlin 2003, pp. 35-51. Full version: e-print `arXiv:cs.CR/0304014`.
20. "'Extrinsic' and 'intrinsic' data in quantum measurements: asymptotic convex decomposition of positive operator valued measures", Commun. Math. Phys. **244**:157-185, 2004.
21. (with K. Matsumoto and T. Shimono) "Remarks on additivity of the Holevo channel capacity and of the entanglement of formation", Commun. Math. Phys. **246**:427-442, 2004.
22. "Quantum and Classical Message Identification via Quantum Channels", in *Quantum Information, Statistics, Probability* (festschrift on the occasion of A. S. Holevo's 60th birthday), (O. Hirota, ed.), pp. 172-189, Rinton Press, 2004. Reprinted in Quantum Inf. Comput. **4**(6&7):563-578, 2004.

23. (with P. Hayden, R. Jozsa and D. Petz) "Structure of states satisfying strong subadditivity of quantum entropy with equality", Commun. Math. Phys. **246**:359-374, 2004.
24. (with K. M. R. Audenaert, C. A. Fuchs and C. King) "Multiplicativity of Accessible Fidelity and Quantumness for Sets of Quantum States", Quantum Inf. Comp. **4**(1):1-11, 2004.
25. (with I. Devetak) "Relating quantum privacy and quantum coherence: an operational approach", Phys. Rev. Lett. **93**(8):080501, 2004.
26. (with P. Hayden, D. W. Leung and P. W. Shor), "Randomizing quantum states: Constructions and applications", Commun. Math. Phys. **250**:371-391, 2004.
27. (with A. Chefles and R. Jozsa) "On the existence of physical transformations between sets of quantum states", Int. J. Quantum Inf. **2**(1):11-21, 2004.
28. (with M. S. Leifer and N. Linden) "Measuring Polynomial Invariants of Multi-Party Quantum States", Phys. Rev. A **68**:052304, 2004.
29. (with M. Christandl) "'Squashed Entanglement' - An Additive Entanglement Measure", J. Math. Phys. **45**(3):829-840, 2004.
30. (with M. Koashi) "Monogamy of entanglement and other correlations", Phys. Rev. A **69**:022309, 2004.
31. (with I. Devetak) "Distilling common randomness from bipartite quantum states", IEEE Trans. Inf. Theory **50**(12):3183-3196, 2004.
32. (with I. Devetak) "Distillation of secret key and entanglement from quantum states", Proc. Roy. Soc. Lond. **461**:207-235, 2004.
33. (with A. Harrow and I. Devetak) "A Family of Quantum Protocols", Proc. IEEE Symp. Inform. Theory, Chicago, IL, 27 June-2 July 2004, p. 134.
34. (with H. Imai, J. Müller-Quade and A. C. A. Nascimento) "Rates for Bit Commitment and Coin Tossing from Noisy Correlation", Proc. IEEE Symp. Inform. Theory, Chicago, IL, 27 June-2 July 2004, p. 47.
35. (with G. Hanaoka, H. Imai, J. Müller-Quade, A. C. A. Nascimento and A. Otsuka) "Information Theoretically Secure Oblivious Polynomial Evaluation: Model, Bounds, and Constructions", Proc. 9th Australasian Conference on Information Security and Privacy, LNCS 3108, Springer Verlag, Berlin 2004, pp. 62-73.
36. (with C. H. Bennett, P. Hayden, D. W. Leung and P. W. Shor) "Remote preparation of quantum states", IEEE Trans. Inf. Theory **51**(1):56-74, 2005.
37. (with I. Devetak and A. Harrow) "A family of quantum protocols", Phys. Rev. Lett. **93**:230504, 2004.
38. (with H. Imai, J. Müller-Quade, A. C. A. Nascimento and P. Tuyls) "An information theoretical model for quantum secret sharing schemes", Quantum. Inf. Comput. **5**(1):68-79, 2005.
39. (with N. Cai and R. W. Yeung) "Quantum Privacy and Quantum Wiretap Channels", Probl. Inf. Transm. **40**(4):318-336, 2004.
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41. (with M. Horodecki and J. Oppenheim) "Partial quantum information", Nature **436**:673-676, 2005.
42. (with M. Christandl), "Uncertainty, Monogamy, and Locking of Quantum Correlations", IEEE Trans. Inf. Theory **51**(9):3159-3165, 2005.
43. (with B. Groisman and S. Popescu) "On the quantum, classical and total amount of correlations in a quantum state", Phys. Rev. A **72**(3):032317, 2005.
44. (with J. A. Smolin and F. Verstraete) "Entanglement of assistance and multipartite state distillation", Phys. Rev. A **72**(5):052317, 2005.
45. (with G. V. Klimovitch) "Classical Capacity of Quantum Binary Adder Channels", e-print `quant-ph/0507045`, 2005.
46. (with J. Oppenheim) "Uncommon information", e-print `quant-ph/0511082`, 2005.
47. (with J. Oppenheim and R. W. Spekkens) "A classical analogue of negative information", e-print `quant-ph/0511247`, 2005.
48. (with M. Christandl) "Uncertainty, Monogamy, and Locking of Quantum Correlations", Proc. IEEE Symp. Inform. Theory, Adelaide, 5-9 September 2005, pp. 879-883.
49. "Secret, Public, and Quantum Correlation Cost of Triples of Random Variables", Proc. IEEE Symp. Inform. Theory, Chicago, IL, 5-9 September 2005, pp. 2270-2274.
50. "Identification via Quantum Channels in the Presence of Prior Correlation and Feedback", in *General Theory of Information Transfer and Combinatorics* (eds. R. Ahlswede, L. Bäumer, N. Cai, H. K. Aydinian, V. Blinovsky, C. Deppe and H. Mashurian), Springer LNCS 4123, pp. 486-504, 2006.
51. (with C. Ahn, A. Doherty and P. Hayden) "On the distributed compression of quantum information", IEEE Trans. Inf. Theory **52**(10):4349-4357, 2006.
52. (with P. Hayden and D. W. Leung) "Aspects of generic entanglement", Commun. Math. Phys. **265**(1):95-117, 2006.

53. (with A. Abeyesinghe, P. Hayden and G. Smith) "Optimal superdense coding of entangled states", IEEE Trans. Inf. Theory **52**(8):3635-3641, 2006.
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56. (with Ll. Masanes, R. Renner, M. Christandl and J. Barrett) "Unconditional security of key distribution from causality constraints", e-print `quant-ph/ 0606049`, 2006.
57. (with A. Harrow) "How many copies are needed for state discrimination?", to appear in IEEE Trans. Inf. Theory. E-print `quant-ph/0606131`, 2006.
58. "On environment-assisted capacities of quantum channels", Markov Proc. Rel. Fields **13**(1-2):297-314, 2007.
59. (with M. Horodecki and J. Oppenheim) "Quantum state merging and negative information", Commun. Math. Phys. **269**(1):107-136, 2007.
60. (with J. P. Keating, N. Linden and J. C. F. Matthews) "Localization and its consequences for quantum walk algorithms and quantum communication", Phys. Rev. A **76**:012315, 2007.
61. (with B. Ibinson and N. Linden) "All Inequalities for the Relative Entropy", Commun. Math. Phys. **269**(1):223-238, 2007.
62. (with P. J. Cameron, A. Montanaro, M. W. Newman and S. Severini) "On the quantum chromatic number of a graph", Electronic J. Combinatorics **14**(1), 2007.
63. (with N. Linden, S. Popescu and A. J. Short) "No quantum advantage for nonlocal computation", Phys. Rev. Lett. **99**:180502, 2007.
64. (with A. Montanaro) "A lower bound on entanglement-assisted quantum communication complexity", Proc. 34th ICALP'07, Wrocław, 9-13 July 2007, Springer LNCS 4596, pp. 122-133. E-print `quant-ph/0610085`, 2006.
65. "The maximum output p-norm of quantum channels is not multiplicative for any $p > 2$", e-print `arXiv[quant-ph]:0707.0402`, 2007.
66. (with B. Ibinson and N. Linden) "Robustness of quantum Markov chains", Commun. Math. Phys. **277**(2):289-304, 2008.
67. (with J. Anders) "Entanglement and separability of quantum harmonic oscillator systems at finite temperature", Quantum Inf. Comput. **8**(3&4):245-262, 2008.
68. (with P. Hayden, M. Horodecki and J. Yard) "A decoupling approach to the quantum capacity", Open Syst. Inf. Dyn. **15**(1):7-19, 2008.
69. (with M. Horodecki and S. Lloyd) "Quantum coding theorem from privacy and distinguishability", Open Syst. Inf. Dyn. **15**(1):47-69, 2008.
70. (with P. Hayden and P. W. Shor) "Random quantum codes from Gaussian ensembles and an uncertainty relation", Open Syst. Inf. Dyn. **15**(1):71-89, 2008.
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73. (with M.-H. Hsieh and I. Devetak) "Entanglement-Assisted Capacity of Quantum Multiple Access Channels", IEEE Trans. Inf. Theory **54**(7):3078-3090, 2008.
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