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# Dr. Matthew Saul Leifer

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## Work Experience

### Academic Positions

**Assistant Professor** Jan. 2016 - Present

*Schmid College of Science and Technology, Chapman University, Orange CA, USA*

**Long Term Visitor** Aug. 2013 - Dec. 2015

*Perimeter Institute for Theoretical Physics, Waterloo, ON, Canada*

**Not working due to illness** Jan. 2012 - Aug. 2013

**Part Time Research Associate** Dec. 2010 - Dec. 2011

*Department of Physics and Astronomy, University College London, London, UK*

**Not working due to illness** Apr. 2008 - Nov. 2010

**Postdoctoral Fellow in Quantum Information Theory** Jan. 2007 - Apr. 2008

*Institute for Quantum Computing/Department of Applied Math, University of Waterloo, ON, Canada*

**Associate Postdoctoral Fellow in Quantum Foundations** Jan. 2007 - Apr. 2008

*Perimeter Institute for Theoretical Physics, Waterloo, ON, Canada*

**Research Associate in Quantum Information Theory and Quantum Foundations** Oct. 2006 - Jan. 2007

*Centre for Quantum Computing, DAMTP, University of Cambridge, Cambridge, UK*

**Postdoctoral Fellow in Quantum Information Theory and Quantum Foundations** Jan. 2004 - Sep. 2006

*Perimeter Institute for Theoretical Physics, Waterloo, ON, Canada*

**Research Assistant in Quantum Information Theory** Nov. 2003 - Dec. 2003

*School of Mathematics, University of Bristol, Bristol, UK*

## Teaching Experience

### Graduate Lecturing

- Introduction to Bayesian Networks (three lectures), University of Queensland, Australia, Oct. 2005

### Undergraduate Lecturing

- PHYS201 (General Physics III), Chapman University, USA, Aug. 2016 — Dec. 2016
- PHYS451 (Quantum Mechanics), Chapman University, USA, Aug. 2016 — Dec. 2016
- PHYS102 (General Physics II), Chapman University, USA, Feb. 2016 — May 2016
- MATH137 (Intro. Calculus for Math Hons.), University of Waterloo, Canada, Sep. 2007 — Dec. 2007
- Advanced Quantum Mechanics (two lectures covering for lecturer's absence), University of Waterloo, Canada, Sep. 2006
- Interpretations of Quantum Mechanics: Current Status and Future Directions (guest lecture on Quantum Logic), University of Waterloo, Canada, Mar. 2005

### Undergraduate Independent Studies

- IS304: Is the quantum state real? (supervisor for independent studies student D. Jia) University of Waterloo, Canada, Jan. 2015 — Apr. 2015

### Undergraduate Tutoring

- Mathematics 1A (Math for 1st year Physics, Chemistry and Economics Students), University of Bristol, UK, Oct. 2000 — June 2003

### Undergraduate Computer Lab Demonstrating

- Mathematics 1A (Maple and MATLAB), University of Bristol, UK, Oct. 2001 — June 2003

## Research Student Supervision

### T. Waterhouse

Jan. 2008 - Apr. 2008

*visiting Ph.D. student from University of British Columbia*

Project: Temporal Joint Measurements

### O. Dahlsten

July 2007 - Sep. 2007

*visiting Ph. D. student from Imperial College*

Project: Unentangled Bit Commitment in Generic Probabilistic Models

### R. Morris

June 2007 - Aug. 2007

*University of Waterloo Undergraduate Research Student*

Project: Distinguishability as a Resource Theory

## Education

**Ph.D. in Applied Mathematics** Oct. 2003

*University of Bristol (Bristol, United Kingdom)*

Research area: Quantum Information Theory

Thesis Title: Entangled Quantum Dynamics. Advisor: Prof. Noah Linden.

**Master of Advanced Studies in Mathematics (Maths Tripos Part III)** July 2000

*University of Cambridge (Cambridge, United Kingdom)*

Passed with distinction

**B.Sc. in Physics with Theoretical Physics** July 1999

*University of Manchester (Manchester, United Kingdom)*

Passed with 1st class hon.

## Publications

### Articles in Refereed Journals

- “[No Return to Classical Reality](#)” D. Jennings and M. Leifer. *Contemporary Physics*, 2016, Volume 57, pp. 60—82. eprint arXiv:1501.03202
- “[Is the quantum state real? An extended review of psi-ontology theorems](#)” M. S. Leifer. *Quanta*, 2014, Volume 3, pp. 67—155. eprint arXiv:1409.1570
- “[Psi-epistemic models are exponentially bad at explaining the distinguishability of quantum states](#)” M. S. Leifer. *Phys. Rev. Lett.*, 2014, Volume 112, pp. 160404. eprint arXiv:1401.7996
- “[A Bayesian approach to compatibility, improvement, and pooling of quantum states](#)” M. S. Leifer and R. W. Spekkens. *J.Phys. A*, 2014, Volume 47, pp. 275301. eprint arXiv:1110.1085. Selected by the editors for inclusion in the "Highlights of 2014" collection.
- “[Towards a Formulation of Quantum Theory as a Causally Neutral Theory of Bayesian Inference](#)” M. S. Leifer and R. W. Spekkens. *Phys. Rev. A*, 2013, Volume 88, pp. 052130. eprint arXiv:1107.5849
- “[Maximally epistemic interpretations of the quantum state and contextuality](#)” M. S. Leifer and O. J. E. Maroney. *Phys. Rev. Lett.*, 2013, Volume 110, pp. 120401. eprint arXiv:1208.5132
- “[Entropy and Information Causality in General Probabilistic Theories \(addendum\)](#)” H. Barnum, J. Barrett, L. Clark, M. Leifer, R. Spekkens, N. Stepanik, A. Wilce, and R. Wilke. *New J. Phys.*, 2012, Volume 14, pp. 129401.
- “[Entropy and Information Causality in General Probabilistic Theories](#)” H. Barnum, J. Barrett, L. Clark, M. Leifer, R. Spekkens, N. Stepanik, A. Wilce, and R. Wilke. *New J. Phys.*, 2010, Volume 12, pp. 033024. eprint arXiv:0909.5075
- “[The de Finetti Theorem for Test Spaces](#)” J. Barrett and M. Leifer. *New J. Phys.*, 2009, Volume 11, pp. 033024. eprint arXiv:0712.2265

- “[Quantum Graphical Models and Belief Propagation](#)” M. Leifer and D. Poulin. *Ann. Phys.*, 2008, Volume 323, pp. 1899. eprint arXiv:0708.1337
- “[Generalized No-Broadcasting Theorem](#)” H. Barnum, J. Barrett, M. Leifer, and A. Wilce. *Phys. Rev. Lett.*, 2007, Volume 99, pp. 240501. eprint arXiv:0707.0620
- “[Quantum Dynamics as an Analog of Conditional Probability](#)” M. S. Leifer. *Phys. Rev. A*, 2006, Volume 74, pp. 042310. eprint arXiv:quant-ph/0606022
- “[Bell's Jump Process in Discrete Time](#)” J. Barrett, M. Leifer, and R. Tumulka. *Europhysics Letters*, 2005, Volume 72, pp. 685—690. eprint arXiv:quant-ph/0506066
- “[Pre- and Post-Selection Paradoxes and Contextuality in Quantum Mechanics](#)” M. S. Leifer and R. W. Spekkens. *Phys. Rev. Lett.*, 2005, Volume 95, pp. 200405. eprint arXiv:quant-ph/0412178
- “[Measuring Polynomial Invariants of Multi-Party Quantum States](#)” M. S. Leifer, N. Linden, and A. Winter. *Phys. Rev. A*, 2004, Volume 69, pp. 052304. eprint arXiv:quant-ph/0308008
- “[Optimal Entanglement Generation from Quantum Operations](#)” M. S. Leifer, L. Henderson, and N. Linden. *Phys. Rev. A*, 2003, Volume 67, pp. 012306. eprint arXiv:quant-ph/0205055
- “[Optimal Simulation of Two-Qubit Hamiltonians using General Local Operations](#)” C. H. Bennett, J. I. Cirac, M. S. Leifer, D. W. Leung, N. Linden, S. Popescu, and G. Vidal. *Phys. Rev. A*, 2002, Volume 66, pp. 012305. eprint arXiv:quant-ph/0107035

## Articles in Conference Proceedings

- “[Logical pre- and post-selection paradoxes are proofs of contextuality](#)” M. F. Pusey and M. S. Leifer, 2015. eprint arXiv:1506.07850. Appeared in Proc. 12th International Workshop on Quantum Physics and Logic (QPL2015), Electronic Proceedings in Theoretical Computer Science vol. 195, edited by C. Heunen, P. Selinger and J. Vicary, pp. 295-306.
- “[Teleportation in General Probabilistic Theories](#)” H. Barnum, J. Barrett, M. Leifer, and A. Wilce. *Clifford Lectures*, 2012. eprint arXiv:0805.3553. Appeared in Mathematical Foundations of Information Flow: Proceedings of the Clifford Lectures 2008, Proceedings of Symposia in Applied Mathematics vol. 71, edited by S. Abramsky and M. Mislove, pp. 25-47, (AMS).
- “[Nonclassicality without Entanglement Enables Bit Commitment](#)” H. Barnum, O. C. O. Dahlsten, M. Leifer, and B. Toner. *IEEE Information Theory Workshop*, 2008. eprint arXiv:0803.1264. Appeared in Proceedings of IEEE Information Theory Workshop 2008 pp. 386—390.
- “[Conditional Density Operators and the Subjectivity of Quantum Operations](#)” M. S. Leifer. *Foundations of Probability and Physics—4*, 2006. eprint arXiv:quant-ph/0611233. Appeared in AIP Conference Proceedings vol. 889 edited by G. Adenier, C. A. Fuchs and A. Yu. Khrennikov, pp. 172—186 (2007).
- “[Logical Pre- and Post-Selection Paradoxes, Measurement-Disturbance and Contextuality](#)” M. S. Leifer and R. W. Spekkens. *Quantum Structures*, 2004. eprint arXiv:quant-ph/0412179. Appeared in Int. J. Theor. Phys. vol. 44 pp. 1977—1987 (2005).

## Book Chapters

- “[Mathematics Is Physics](#)” M. S. Leifer. 2016. eprint arXiv:1508.02770. Second prize winner in 2015 FQXi Essay Contest "Trick or Truth: the Mysterious Connection Between Physics and Mathematics". Appeared in "Trick or Truth? The Mysterious Connection Between Physics and Mathematics" edited by A. Aguirre, B. Foster and Z. Merali, pp. 21—40 (Springer).

- [“It from bit” and the quantum probability rule](#)” M. S. Leifer. 2015. eprint arXiv:1311.0857. Winning entry of the 2013 FQXi Essay Contest. Appeared in "It From Bit or Bit From It? On Physics and Information" edited by A. Aguirre, B. Foster and Z. Merali, pp. 5—22 (Springer).

## Preprints

- [“Is a time symmetric interpretation of quantum theory possible without retrocausality?”](#) M. Leifer and M. Pusey. 2016. eprint arXiv:1607.07871
- [“Why protective measurement does not establish the reality of the quantum state”](#) J. Combes, C. Ferrie, M. S. Leifer, and M. F. Pusey. 2015. eprint arXiv:1509.08893
- [“Plausibility measures on test spaces”](#) T. Fritz and M. Leifer. 2015. eprint arXiv:1505.01151
- [“Cloning and Broadcasting in Generic Probabilistic Theories”](#) H. Barnum, J. Barrett, M. Leifer, and A. Wilce. 2006. eprint arXiv:quant-ph/0611295
- [“Nondeterministic Testing of Sequential Quantum Logic Propositions on a Quantum Computer”](#) M. S. Leifer. 2005. eprint arXiv:quant-ph/0509193

## Book Reviews

- [“Einstein and the Quantum: The Quest of the Valiant Swabian by A. Douglas Stone”](#) M. S. Leifer. 2016. Spontaneous Generations, vol. 8, iss. 1, pp. 105—108
- [“Computing With Quantum Cats: From Colossus To Qubits by John Gribbin and Schrödinger's Killer App: Race To Build The World's First Quantum Computer by Jonathan Dowling”](#) M. S. Leifer. 2013. The Quantum Times (Newsletter of the APS Topical Group on Quantum Information), vol. 7, iss. 2, p. 8—10
- [“The Mathematical Language of Quantum Theory: From Uncertainty to Entanglement by Teiko Heinosaari and Mario Ziman”](#) M. S. Leifer. 2012. The Quantum Times (Newsletter of the APS Topical Group on Quantum Information), vol. 7, iss. 1, p. 11—13
- [“Elegance and Enigma: The Quantum Interviews by Maximilian Schlosshauer”](#) M. S. Leifer. 2012. American Journal of Physics, vol. 80, iss. 3, p. 266

## Newsletter Articles

- [“Point–Counterpoint: Can anything be learned from surveys on the interpretations of quantum mechanics?”](#) M. S. Leifer. 2013. The Quantum Times (Newsletter of the APS Topical Group on Quantum Information), vol. 7, iss. 2, p. 4–6
- [“Response to Griffiths”](#) M. S. Leifer. 2012. The Quantum Times (Newsletter of the APS Topical Group on Quantum Information), vol. 6, iss. 4, p. 6
- [“PBR, EPR, and all that jazz”](#) M. S. Leifer. 2012. The Quantum Times (Newsletter of the APS Topical Group on Quantum Information), vol. 6, iss. 3, pp. 1--3

## Talks and Poster Presentations

### Panel Discussions

- [“Prospects and limitations of information theoretic approaches”](#) Information Theoretic Foundations for Physics. Perimeter Institute, Canada. May 16, 2015.

- “[Seeing Without Looking: How to Teach Physics Foundations](#)” New Directions in the Foundations of Physics. Washington DC, USA. Apr. 25, 2015.

## Invited Talks at Conferences and Workshops

- “[Dirty secrets of quantum foundations](#)” 5th International FQXi Conference. Banff, Canada. Aug. 18, 2016.
- “[Does time-symmetry in quantum theory imply retrocausality?](#)” Concepts and Paradoxes in a Quantum Universe. Perimeter Institute, Canada. June 22, 2016.
- “[Informal talks on Spekkens contextuality, interpretations of quantum theory, and the reality of the quantum state](#)” Workshop on Quantum Correlations, Contextuality and All That. Natal, Brazil. Nov. 9, 2015 - Nov. 13, 2015.
- “[The reality of the quantum state from Kochen-Specker contextuality](#)” Emergent Quantum Mechanics. Vienna, Austria. Oct. 23, 2015.
- “[Aharonov meets Spekkens: What do quantum paradoxes tell us about the nature of reality?](#)” Convergence (Quantum Foundations Workshop). Perimeter Institute, Canada. June 24, 2015.
- “[Ontological Models in the Block Universe](#)” Free Will and Retrocausality in the Quantum World. Cambridge, UK. July 3, 2014.
- “[Is the Quantum State Real?](#)” 12th Biennial IQSA Meeting. Olomouc, Czech Republic. June 24, 2014.
- “[Ontic versus Epistemic Interpretations of the Wave Function](#)” Information and Interaction: Eddington, Wheeler, and the Limits of Knowledge. Cambridge, UK. Mar. 22, 2014.
- “[Bounds on Epistemic Interpretations of the Quantum State from Contextuality](#)” APS March Meeting. Denver, USA. Mar. 6, 2014.
- “[Formulating Quantum Theory as a Causally Neutral Theory of Bayesian Inference](#)” ColLoQuI (Colleges of London Quantum Information Meeting). Royal Holloway, University of London, UK. June 23, 2011.
- “[The Two Churches of Quantum Theory](#)” Pictures, Quanta, Probability. Oxford, UK. Aug. 18, 2010.
- “[Unentangled Bit Commitment and the Clifton-Bub-Halvorson \(CBH\) Theorem](#)” Mini-Workshop on Quantum Foils. Pavia, Italy. Dec. 18, 2007.
- “[Quantum Causal Networks: A Quantum Informationish Approach to Causality in Quantum Theory](#)” Quantum Information Theory in Quantum Gravity. Perimeter Institute, Canada. Dec. 10, 2007.
- “[Open Questions in Ontological Models](#)” Operational Probabilistic Theories as Foils to Quantum Theory. Cambridge, UK. July 6, 2007.
- “[Separations of Generalized Probabilistic Theories via their Information Processing Capabilities](#)” Operational Quantum Physics and the Quantum-Classical Contrast. Perimeter Institute, Canada. June 4, 2007.
- “[Quantum Dynamics as Generalized Conditional Probabilities](#)” Foundations of Physics and Probability—4. Växjö, Sweden. June 8, 2006.
- “[Quantum Analogs of Bayes' Rule](#)” Being Bayesian in a Quantum World. Konstanz, Germany. Aug. 2005.

- “[Nondeterministic Testing of Sequential Quantum Logic Propositions on a Quantum Computer](#)” Quantum Information, Computation and Logic: Exploring New Connections. Perimeter Institute, Canada. July 19, 2005.
- “Measuring Polynomial Invariants of Multi-Party Quantum States” QuICT Network Meeting. Abingdon, UK. July 2003.

### Invited Commentaries at Conferences and Workshops

- “[Commentary on Jeffrey Bub: Yes! We have no bananas](#)” Information-Theoretic Interpretations of Quantum Mechanics. University of Western Ontario, Canada. June 11, 2016.

### Contributed Talks at Conferences, Workshops and Summer Schools

- “[Does time-symmetry in quantum theory imply retrocausality?](#)” The 18th UK and European Conference on Foundations of Physics. London School of Economics, UK. July 17, 2016.
- “[Plausibility Measures on Test Spaces](#)” 13th Biennial IQSA Meeting. University of Leicester, UK. July 13, 2016.
- “[Logical pre- and post-selection paradoxes are proofs of contextuality](#)” Conference on Quantum Information and Quantum Control. Fields Institute, Toronto, Canada. Aug. 21, 2015.
- “[Does protective measurement imply the reality of the quantum state?](#)” APS March Meeting. San Antonio, USA. Mar. 4, 2015.
- “Cloning, Broadcasting and the de Finetti theorem in Generalized Probabilistic Theories” APS March Meeting. Denver, USA. Mar. 5, 2007.
- “Conditional Density Operators in Quantum Information” Operator Structures in Quantum Information. Banff, Canada. Feb. 12, 2007.
- “Quantum Causal Networks” Cats, Kets and Cloisters. Oxford, UK. July 21, 2006.
- “Quantum Dynamics as Generalized Conditional Probabilities” 8th Biennial IQSA Meeting. Malta. July 13, 2006.
- “Entanglement of Overlapping Systems and the Breakdown of the Tensor Product” APS March Meeting. Baltimore, USA. Mar. 13, 2006.
- “Quantum Analogs of Bayes' Rule” Summer School on Philosophy, Probability and Physics. Konstanz, Germany. Aug. 2005.
- “Logical Pre- and Post-Selection Paradoxes, Measurement-Disturbance, and Contextuality” 7th Biennial IQSA Meeting. Denver, USA. July 2004.
- “Measuring Polynomial Invariants of Multi-Party Quantum States” 4th European QIPC Workshop. Oxford, UK. July 2003.
- “Optimal Entanglement Generation from Quantum Operations” Informal Quantum Information Gathering. Imperial College, London, UK. Sep. 2002.
- “Multi-particle Entanglement in Quantum States and Evolutions” Winter School on “QuEnt” Quantum Entanglement and Quantum Information. Les Houches, France. Mar. 2001.

### Poster Presentations at Conferences and Workshops

- “[Plausibility Measures on Test Spaces](#)” Quantum Physics and Logic. Oxford, UK. July 15, 2015.

- “Psi-Epistemic Models are Exponentially Bad at Explaining the Distinguishability of Quantum States” Quantum Unspeakeables II: 50 Years of Bell’s Theorem. Vienna, Austria. June 2014.
- “Pre- and Post-Selection Paradoxes and Contextuality in Quantum Mechanics” The Seventh International Conference on Quantum Communication, Measurement and Computing. Glasgow, UK. July 2004.
- “Pre- and Post-Selection Paradoxes and Contextuality in Quantum Mechanics” Reference Frames and Superselection Rules in Quantum Information Theory. Perimeter Institute, Canada. July 2004.
- “Measuring Polynomial Invariants of Multi-Party Quantum States” MaPhySto/QUANTOP Workshop on Quantum Measurements and Quantum Stochastics. Aarhus, Denmark. Aug. 2003.
- “Optimal Entanglement Generation from Quantum Operations” The Sixth International Conference on Quantum Communication, Measurement and Computing. MIT, Cambridge, USA. July 2002.
- “Optimal Entanglement Generation from Quantum Operations” Quantum Information: Conceptual Foundations, Developments and Perspectives. Oviedo, Spain. July 2002.
- “Simulation of 2-qubit Hamiltonians using General Local Operations” London Mathematical Society Regional Meeting. University of Bristol, UK. Sep. 2001.

## Seminars

- “[Everything you wanted to know about the reality of the quantum state, but were afraid to ask Matt Pusey](#)” Quantum Foundations Seminar. Perimeter Institute, Canada. June 17, 2016.
- “[Does time-symmetry in quantum theory imply retrocausality?](#)” Southern California Philosophy of Physics Reading Group. UC Irvine, USA. Mar. 5, 2016.
- “Does time-symmetry in quantum theory imply retrocausality?” Quantum Group Meeting. Chapman University, USA. Feb. 4, 2016.
- “Bounds on psi-epistemic explanations of quantum indistinguishability from noncontextuality inequalities” Quantum Seminar. University of Oxford, UK. Oct. 29, 2015.
- “Plausibility Measures on Test Spaces” Quantum Foundations Seminar. University of Vienna, Austria. Oct. 22, 2015.
- “Bounds on psi-epistemic explanations of quantum indistinguishability from noncontextuality inequalities” Quantum Information Seminar. University College London, UK. Oct. 19, 2015.
- “Aharonov Meets Spekkens: What do quantum paradoxes tell us about the nature of reality?” Quantum Information and Foundations Seminar. University of Cambridge, UK. Oct. 15, 2015.
- “Probabilities in quantum theory and beyond” Quantum Information group meeting. Imperial College, London, UK. Oct. 14, 2015.
- “What Are Quantum States?” Physics and Computational Science Seminar. Chapman University, USA. Jan. 28, 2015.
- “2 out of 3 Roads to Quantum Foundations” Quantum Foundations Seminar. IQOQI Vienna, Austria. Dec. 10, 2014.
- “A Survey of Quantum Conditional States and their Applications” Applied Mathematics Seminar. University of Western Ontario, Canada. June 4, 2014.
- “Is the Wavefunction Real?” Philosophy of Physics Seminar. University of Western Ontario, Canada. June 3, 2014.

- “Psi-Epistemic Models are Exponentially Bad at Explaining the Distinguishability of Quantum States” Theoretical Physics Seminar. Imperial College, UK. Apr. 3, 2014.
- “Is the Wavefunction Real?” Philosophy of Physics Seminar. University of Bristol, UK. Apr. 2, 2014.
- “Psi-Epistemic Models are Exponentially Bad at Explaining the Distinguishability of Quantum States” Quantum Foundations Seminar. Perimeter Institute, Canada. Feb. 18, 2014.
- “Quantum Theory as a Causally Neutral Theory of Bayesian Inference” Philosophy of Physics Seminar. Oxford University, UK. Oct. 20, 2011.
- “Quantum Conditional States, Bayes' Rule and Quantum Pooling” Quantum Foundations Seminar. University of Toronto, Canada. May 26, 2011.
- “Quantum Conditional States, Bayes' Rule and Quantum Pooling” Quantum Foundations Seminar. Perimeter Institute, Canada. May 17, 2011.
- “Quantum Conditional States, Bayes' Rule, and State Compatibility” Quantum Information Seminar. University of Sherbrooke, Canada. May 6, 2011.
- “Quantum Conditional States, Bayes' Rule, and State Compatibility” Institute for Quantum Computing Seminar. University of Waterloo, Canada. Apr. 5, 2011.
- “Quantum Conditional States, Bayes' Rule, and State Compatibility” Centre for Quantum Information and Foundations Seminar. University of Cambridge, UK. Mar. 3, 2011.
- “Quantum Conditional States, Bayes' Rule, and State Compatibility” Quantum Dynamics Seminar. Royal Holloway, UK. Feb. 3, 2011.
- “Quantum Conditional States, Bayes' Rule, and State Compatibility” Quantum Dynamics Seminar. Imperial College, UK. Dec. 14, 2010.
- “Cloning and Broadcasting in Generalized Probabilistic Theories” Quantum Information Seminar. CalTech, USA. Feb. 20, 2007.
- “Cloning and Broadcasting in Generalized Probabilistic Theories” Quantum Information Seminar. University of Cambridge, UK. Nov. 2006.
- “Cloning and Broadcasting in Generalized Probabilistic Theories” Quantum Information Seminar. University of Bristol, UK. Nov. 2006.
- “Cloning and Broadcasting in Generalized Probabilistic Theories” Quantum Information Seminar. Imperial College, UK. Nov. 2006.
- “Cloning and Broadcasting in Generalized Probabilistic Theories” Quantum Information Seminar. Royal Holloway, UK. Nov. 2006.
- “Cloning and Broadcasting in Generalized Probabilistic Theories” Quantum Information Seminar. University of Leeds, UK. Oct. 2006.
- “Quantum Dynamics as Generalized Conditional Probabilities” Quantum Information and Geometric Statistics Seminar. University of Guelph, Canada. Sep. 19, 2006.
- “Quantum Causal Networks” PiQuDos Seminar. Perimeter Institute, Canada. June 28, 2006.
- “Quantum Causal Networks” Quantum Information Seminar. Los Alamos National Laboratory, USA. Apr. 2006.

- “Quantum Causal Networks” Quantum Information Seminar. University of New Mexico, USA. Apr. 2006.
- “Quantum Causal Networks” Institute for Quantum Computing Seminar. University of Waterloo, Canada. Apr. 2006.
- “Noncommuting Subsystems and the Breakdown of the Tensor Product” Quantum Information Seminar. ERATO Tokyo, Japan. Feb. 6, 2006.
- “Is Quantum Computing Quantum Logical?” Quantum Information Seminar. Technical University of Innsbruck, Austria. Jan. 2006.
- “Entanglement of Overlapping Systems and the Breakdown of the Tensor Product” Quantum Information Seminar. Imperial College, UK. Jan. 2006.
- “Entanglement of Overlapping Systems and the Breakdown of the Tensor Product” Mathematical Physics Seminar. University of York, UK. Jan. 9, 2006.
- “What's Wrong with these Quantum Computations?” Quantum Information Seminar. University of Sydney, Australia. Nov. 2005.
- “Do we Need a Logic of Quantum Computation?” Quantum Information Seminar. Griffith University, Australia. Oct. 2005.
- “Do we Need a Logic of Quantum Computation?” Quantum Information Seminar. University of Queensland, Australia. Oct. 2005.
- “Pre- and Post-Selection Paradoxes, Measurement-Disturbance and Contextuality in Quantum Mechanics” Quantum Information Seminar. Bell Labs, USA. Apr. 2005.
- [“Pre- and Post-Selection Paradoxes, Measurement-Disturbance and Contextuality in Quantum Mechanics”](#) PiQuDos Seminar. Perimeter Institute, Canada. Nov. 10, 2004.
- “Measuring Polynomial Invariants of Multi-Party Quantum States” PiQuDos Seminar. Perimeter Institute, Canada. Jan. 2003.
- “Optimal Entanglement Generation from Quantum Operations” Quantum Information Seminar. University of Bristol, UK. Aug. 2002.
- “Multi-particle Entanglement in Quantum States and Evolutions” Applied Mathematics Seminar. University of Bristol, UK. Jan. 2001.
- “Multi-particle Entanglement in Quantum States and Evolutions” Applied Mathematics Seminar. University of Bristol, UK. Jan. 2001.

## Scholarships and Awards

- Second prize, FQXi essay contest. Foundational Questions Institute (FQXi.org), 2015
- First prize, FQXi essay contest. Foundational Questions Institute (FQXi.org), 2013
- Mary Higgins Postgraduate Scholarship. Girton College, Cambridge, 2000
- C. B. West Postgraduate Prize in Mathematics. Girton College, Cambridge, 2000
- Platt Prize in Physics. University of Manchester, 1999

- Heginbottom Exhibition for best performance in first year exams in Physics. University of Manchester, 1997

## **Academic Service**

### **Committees**

- Postdoc Representative, Postdoc Hiring Committee, Perimeter Institute, Canada, Nov. 2004 - June 2005
- Postdoc Representative, Quantum Information Faculty Hiring Committee, Perimeter Institute, Canada, Jan. 2004 - June 2005

### **Refereeing for Journals**

- Foundations of Physics, Information, Journal of Physics A, Nature Physics, New Journal of Physics, Philosophy of Science, Physical Review A, Physical Review D, Physical Review Letters, Physical Review X, Physics Essays, Quanta, Quantum Information and Computation, Quantum Studies: Mathematics and Foundations, Studies in the History and Philosophy of Modern Physics, Synthese

### **Refereeing for International Conferences**

- IEEE International Symposium on Information Theory, Quantum Information Processing, Quantum Physics and Logic, UK and European Conference on Foundations of Physics

### **Refereeing for Academic Book Publishers**

- Springer

### **Refereeing for Research Grant Panels**

- National Science Center (Poland)

### **Editorial Work**

- Book reviews editor and editorial board member, "The Quantum Times", newsletter of the APS Topical Group on Quantum Information, Jan. 2008 - present

### **Confereces, Workshops and Summer Schools Organized**

- Focus session on Gamification and other novel approaches in quantum physics outreach, APS March Meeting, New Orleans, USA, Mar. 2017
- 18th UK and European Conference on Foundations of Physics (programme committee member), July 2016
- Quantum Physics and Logic 2016, Strathclyde, UK (programme committee member), June 2016
- Making Sense of Quantum Mechanics & Concepts and Paradoxes in a Quantum Universe (co-organized with Y. Aharonov, J. Dressel, L. Hardy, and J. Tollaksen), June 2016
- Quantum Physics and Logic 2015, Oxford, UK (programme committee member), July 2015
- London Foundations Connection, Imperial College, London, UK (advisory committee member), May 2013
- London Foundations Connection, University of London, UK (co-organized with A. Caulton), Apr. 2012

- Invited Session on Quantum Information Meets Gravitation, APS March Meeting, New Orleans, USA (co-organized with L. Viola), Mar. 2008
- Quantum Foundations Summer School, Perimeter Institute, Canada (co-organized with H. Burton and L. Hardy), Aug. 2007
- Workshop on Quantum Information, Computation and Logic: Exploring New Connections, Perimeter Institute, Canada (co-organized with H. Barnum), July 2005

### **Seminar Series Organized**

- Q+ hangouts: Online seminars on quantum information and quantum foundations (co-organized with D. Burgarth). See <http://qplus.burgarth.de> and <http://qplus.to/qplus> for details, Aug. 2011 - Jan. 2016

### **Discussion Groups Organized**

- Contextuality Workgroup of Perimeter Institute Experts (CoWPIE), Perimeter Institute, Canada, 2004 - 2005
- Quantum Information Journal Club, University of Bristol, UK, 2002 - 2003

### **Additional Items**

#### **Research Grants**

- 2016 - 2017: 9,775USD FQXi mini-grant (Foundational Questions Institute <http://www.fqxi.org>) for Institute for Quantum Studies Visitor Program — Role: Principal Investigator
- 2015 - 2017: 52,601USD FQXi award (Foundational Questions Institute <http://www.fqxi.org>) for project on Quantum Theory in the Block Universe — Role: Principal Investigator
- 2013 - 2015: 119,888USD FQXi award (Foundational Questions Institute <http://www.fqxi.org>) for project on Thermodynamic vs information theoretic entropies in probabilistic theories — Role: Co-Investigator (PI: J. Barrett, University of Oxford)
- 2011: 1,500USD FQXi mini-grant (Foundational Questions Institute <http://www.fqxi.org>) for London Foundations Connection — Role: Principal Investigator
- 2008: 7,500USD FQXi mini-grant (Foundational Questions Institute <http://www.fqxi.org>) for APS Invited Session: Quantum Information Meets Gravitation — Role: Principal Investigator
- 2007 - 2011: 70,000USD FQXi award (Foundational Questions Institute <http://www.fqxi.org>) for project on Abstract Quantum Probability — Role: Principal Investigator

#### **Professional Development**

- Feb. 2016: Attended 2016 Southern California PKAL Regional Network Annual Meeting on "Integrating Teaching, Assessment, and Education Research to Enhance Student Learning in STEM", UC Irvine, USA
- Jan. 2016: Attended Chapman University January Conference on Critical Thinking

#### **Summer Schools Attended**

- Aug. 2005: Summer School on Philosophy, Probability and Physics, Konstanz, Germany
- July 2004: Summer School on Foundations of Physical Theories, Urbino, Italy

- Mar. 2001: Winter School on "QuEnt" Quantum Entanglement and Quantum Information, Les Houches, France

## **MOOCs Completed**

- Sep. 2015 - Nov. 2015: Coursera: An Introduction to Evidence-Based Undergraduate STEM Teaching, Score 91.5%
- Mar. 2012 - July 2012: Coursera: Probabilistic Graphical Models, Advanced Track, Score 96.6%
- Oct. 2011 - Dec. 2011: Stanford MOOC: Introduction to Artificial Intelligence, Advanced Track, Score 92.4%

## **Programming/Scripting Skills**

- C/C++, HTML, LaTeX, Maple, Matlab, PHP, Python, Sage

*Last updated: Aug. 4, 2016*