

Christopher Alan Fuchs

Curriculum Vitae

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Personal:

Work address: Perimeter Institute for Theoretical Physics
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Research Interests:

Quantum foundations in the light of quantum information
Quantum information theory

Professional Employment:

Senior Researcher, Perimeter Institute for Theoretical Physics, 2007–
Research Staff Member, Bell Labs, Murray Hill, New Jersey, USA, 2000–2007

Education:

Ph. D. in Physics, May 1996, The University of New Mexico, Albuquerque, New Mexico
Dissertation: “Distinguishability and Accessible Information in Quantum Theory”
Advisor: Carlton M. Caves

B. S. in Physics with High Honors, December 1987
B. S. in Mathematics with High Honors, December 1987
The University of Texas at Austin, Austin, Texas
Research Supervisor: John Archibald Wheeler

Titles, Honors, Awards, Marks of Distinction:

Fellow of the American Physical Society, elected 2012.

International Quantum Communication Award, 2010, “for contributions to the theory of quantum communication including quantum state disturbance.”

The ISI Web of Science Citation Index gives a total citation count of $\geq 4,020$, with a Hirsch index $h = 23$ and an average of 109/paper, on the 37 *journal articles* it lists for me. Google Scholar presently gives a total citation count of $\geq 7,800$, with an $h = 36$ and an average 104/item, on my *full record* of 75 (non-editorial) scholarly publications.

Paper A35 was listed among the “top ten breakthroughs of the year 1998” by the editors of *Science*. In 2009, it was ranked as the 59th most cited physics paper for the previous 10 years by *Essential Science Indicators*.

Past Chair, Executive Committee, American Physical Society Topical Group on Quantum Information, 2012. This is the fourth leg of a four-year track on the committee, including Vice Chair 2009, Chair Elect 2010, and Chair 2011. Elected when membership was $\approx 1,100$. Under my leadership, the number of topical-group submissions for the 2011 APS March Meeting grew 40% from the previous year’s.

The *Oxford Dictionary of American Quotations*, edited by H. Rawson and M. Miner, (Oxford University Press, Oxford, UK, 2006), quotes me, p. 742.

Adjunct Professor of Physics, University of Waterloo, Waterloo, Ontario, since 2008.

Adjunct Professor of Applied Mathematics, University of Waterloo, Waterloo, Ontario, since 2008.

Adjunct Professor of Physics and Astronomy, University of New Mexico, Albuquerque, New Mexico, since 2006. (Adjunct Assistant Professor, 2000–2005.)

For Fun: Academic Lineage – F. S. Exner, F. Hasenöhrl, K. Herzfeld, J. A. Wheeler, K. S. Thorne, C. M. Caves, C. A. Fuchs. Erdős number – 3 (but who doesn't have one). Einstein number – 3 (Einstein–Rosen–Peres–Fuchs). Wolfgang Pauli number – 4 (Pauli–Einstein–Rosen–Peres–Fuchs).

Awarded and Endowed Lectures:

Clifford Lecturer, Tulane University, New Orleans, Louisiana, March 2011.

Itamar Pitowsky Memorial Lecturer, Hebrew University, Jerusalem, Israel, February 2011.

Squire Lecturer, Grinnell College, Grinnell, Iowa, 2006.

Michelson Postdoctoral Prize Lectureship, Case Western Reserve University, Cleveland, Ohio, 1998.

Other Tokens of Recognition:

Fellow, Stellenbosch Institute for Advanced Study, January 2012 – January 2013.

Editorial Board, Springer book series *The Western Ontario Series in Philosophy of Science*, since 2010.

Member, Foundational Questions Institute (FQXi), since Fall 2010.

Editorial Board, Springer book series *Fundamental Theories of Physics*, since 2009.

Associate Editor, *Quantum Information and Computation*, Rinton Press, 2000–2012.

Steering Committee, International Conference Series on Quantum Communication, Measurement and Computing (QCMC), since Fall 2010.

Affiliate, Institute for Quantum Computing, University of Waterloo, since Fall 2008.

Member, Programme Committee, 11th International Conference on Quantum Communication, Measurement and Computing (QCMC 2012), Vienna University of Technology, Vienna, Austria, 30 July – 3 August, 2012.

Member, Scientific Committee, Centre de Recherche Mathématiques, Montréal, Canada, Thematic Semester June–December 2011.

2-Year Member-at-Large, Executive Committee, American Physical Society Topical Group on Quantum Information, 2007–2008.

Member, Technology Experts Panel, United States Advanced Research and Development Activity (ARDA) Roadmap for Quantum Cryptography, 2003.

Member, National Science Foundation Review Panel on Mathematical Physics, 2005.

Board Member, International Center for Mathematical Modeling, Linnaeus University, Sweden, since 2001.

Member, Pacific Institute of Theoretical Physics, University of British Columbia, Vancouver, Canada, since 2004.

Postdoctoral Fellowships:

Director-Funded Postdoctoral Fellowship, Los Alamos National Laboratory, Los Alamos, New Mexico. Sponsor: Salman Habib. (October 1999 – October 2000)

Lee A. DuBridge Prize Postdoctoral Fellowship, California Institute of Technology, Pasadena, California. Sponsors: H. Jeff Kimble and John Preskill. (October 1996 – October 1999)

Postdoctoral Fellowship, Département I.R.O., Université de Montréal, Montréal (Québec), Canada. Sponsor: Gilles Brassard. (January 1996 – October 1996)

Grant and Funding Participation:

Project Leader, “That the World Can Be Shaped: Quantum Bayesianism, Counterfactuals, Free Will,” contract for John Templeton Foundation, 1 April 2011 – 31 March 2013. Total funding: 50,000 USD.

- Principal Investigator, “SIC Representations for Quantum States and Quantum Channels” contract for United States Office of Naval Research, 1 October 2008 – 31 December 2012. Total funding: 511,913 USD.
- Senior Personnel, “REU Site: Susquehanna University REU in Mathematics,” contract for National Science Foundation Research Experience for Undergraduate (REU) Program, Spring 2008 – Spring 2011. Total funding: 150,000 USD.
- Principal Investigator (with C. Beisbart, S. Hartmann, and V. Palge), “Antrag zur Foerderung einer Konferenz mit anschließender Sommerschule,” contract for German VolkswagenStiftung, (funds used to organize conference “Being Bayesian in a Quantum World,” 1–5 August 2005, Konstanz, Germany, and an associated summer school). Total funding: 67,000 EUR.
- E. T. S. Walton Visitor Award, Science Foundation Ireland, consisting of the compensation of my Bell Labs salary + 20% cash award + research funds for a sabbatical to Communications Network Research Institute, Dublin, Ireland, April 2003 – August 2004.
- Principal Investigator (with C. M. Caves), “Theoretical Investigations in Quantum Information Science: Quantum Nonlocality and Entanglement,” contract for United States Office of Naval Research, 1 April 2000 – 31 March 2003. Total funding: 300,000 USD.

Organizational Activities:

- Invited by *Foundations of Physics* to organize and edit a 3-issue festschrift in honor of Charles H. Bennett (2012).
- Member, Program Committee, 17th UK and European Meeting on the Foundations of Physics, Ludwig Maximilian University, Munich, Germany, 29–31 July 2013.
- Project Leader, *Tightening the Consistency of Quantum Bayesianism*, Stellenbosch Institute for Advanced Study (STIAS), Stellenbosch, South Africa, 10 March – 22 April 2012. Participating with STIAS Fellows D. M. Appleby, H. Barnum, N. D. Mermin, R. Schack, and C. G. Timpson.
- Co-organizer (with H. Atmanspacher), *The Pauli-Jung Dialog and Its Impact Today*, Filzbach, Switzerland, 23–27 September 2012.
- Co-organizer (with H. Atmanspacher), Special Session on Wolfgang Pauli’s Notion of Quantum Mechanical Incompleteness, *Quantum Theory: Reconsideration of Foundations – 6*, Linnaeus University, Växjö, Sweden, 11–14 June 2012.
- Co-organizer (with G. Brassard), *Quantum Foundations in the Light of Quantum Information III / Fondements de la mécanique quantique à la lumière de l’information quantique III*, Université de Montréal, Montréal, Canada, 6–9 December 2012.
- Organizer and Chair for invited-speaker sessions, “Quantum Information: Featured Experiments,” “20 Years of Quantum Information in Physical Review Letters,” and “Symmetric Discrete Structures for Finite Dimensional Quantum Systems,” *American Physical Society March Meeting 2011*, Dallas, Texas, 21–25 March 2011.
- Co-organizer (with S. Weinstein and D. Wolpert), *Laws of Nature: Their Nature and Knowability*, Perimeter Institute for Theoretical Physics, Waterloo, Ontario, 20–22 May 2010.
- Member, Advisory Committee (with L. Hardy and H. Price), *PIAF ’09: New Perspectives on the Quantum State*, Perimeter Institute for Theoretical Physics, Waterloo, Ontario, 27 September – 2 October 2009.
- Member, International Program and Advisory Committee, *Feynman Festival 2009*, Olomouc, Czech Republic, 22–26 June 2009.
- Co-organizer (with S. T. Flammia), *Seeking SICs: An Intense Workshop on Quantum Frames and Designs*, Perimeter Institute for Theoretical Physics, Waterloo, Ontario, 26–31 October 2008.
- Co-organizer (with G. Bacciagaluppi, L. Hardy, and W. Struyve), *The Clock and the Quantum: Time in Quantum Foundations*, Perimeter Institute for Theoretical Physics, Waterloo, Ontario, 28 September – 2 October 2008.

- Co-organizer (with J.-Å. Larsson), Special Session on Contextuality and Kochen-Specker Theorems, *Foundations of Probability and Physics – 5*, Växjö University, Växjö, Sweden, 25 August 2008.
- Co-organizer (with A. S. Holevo), *Osamu Hirota, a True Quantum Communication Channel*, Perimeter Institute for Theoretical Physics, Waterloo, Ontario, 25–27 June 2008.
- Co-organizer (with S. H. Simon), *Quantum Information Meets Nanotechnology*, Bell Labs, Lucent Technologies, Murray Hill, New Jersey, 11 July 2006.
- Member, Advisory and Award Committee, *Fifth, Sixth, Seventh, and Eighth International Conferences on Quantum Communication, Measurement, and Computing (QCMC)*, 2000, 2002, 2004, 2006.
- Member, Program Committee, American Physical Society Topical Group on Quantum Information, 2006–2007.
- Co-organizer (with A. Khrennikov), *Foundations of Probability and Physics – 4*, Växjö University, Växjö, Sweden, 4–9 June 2006.
- Member, Nominating Committee, American Physical Society Topical Group on Quantum Information, 2005–2006.
- Co-organizer (with M. O. Scully), *Wheelerfest, a Meeting for Quantum Information and Foundations*, Princeton University, Princeton, New Jersey, 24–25 February 2006.
- Co-organizer (with C. M. Caves, S. Hartmann, and R. Schack), *Being Bayesian in a Quantum World*, Konstanz, Germany, 1–5 August 2005.
- Co-organizer (with H. Barnum, R. Hudson, and A. Khrennikov), *Quantum Theory: Reconsideration of Foundations–2, Quantum Logic Meets Quantum Information*, Växjö University, Växjö, Sweden, 1–6 June 2003.
- Co-organizer (with G. Brassard), *Workshop on Quantum Foundations in the Light of Quantum Information II*, Université de Montréal, Montréal, Canada, 13 October – 3 November 2002.
- Co-organizer (with A. Barg, L. Fortnow, and P. W. Shor), *National Science Foundation Planning Workshop on Quantum Communications, Cryptography, and Coding*, Elmsford, New York, 17–18 January 2002.
- Co-organizer (with P. Lahti and A. Khrennikov), *Quantum Theory: Reconsideration of Foundations, Shannon meets Bohr*, Växjö University, Växjö, Sweden, 17–21 June 2001.
- Co-organizer (with O. Hirota), *Second Tokyo International Quantum Information Seminar*, Oiso Prince Hotel, Tokyo, Japan, 11–15 March 2001.
- Co-organizer (with G. Brassard), *Meeting on Quantum Foundations in the Light of Quantum Information and Cryptography*, Université de Montréal, Montréal, Canada, 17–19 May 2000.
- Co-organizer (with O. Hirota), *First Tokyo International Quantum Information Seminar*, Tamagawa University, Tokyo, Japan, 13–14 March 2000.
- Co-organizer (with C. M. Caves and M. H. Holzschneider), *Northern New Mexico Complexity, Entropy, and Physics of Information Seminar Series*, Santa Fe Institute, Santa Fe, New Mexico, January 2000 – October 2000.

Patents:

- C. A. Fuchs, M. Vasilyev and B. Yurke, “Optical Apparatus Having a Polarization Splitter and Multiple Interferometers,” patent number US 7,463,361 B2; issued 9 December 2008.
- C. A. Fuchs, M. Vasilyev and B. Yurke, “Optical Analyzers of Polarization Properties,” patent number US 7,206,069 B2; issued 17 April 2007.

Current Students Supervised:

- H. B. Dang, PhD candidate (NSERC Vanier Canada Scholarship winner), University of Waterloo, Fall 2009 to present.
- G. N. Tabia, PhD candidate, University of Waterloo, Fall 2009 to present.
- M. A. Graydon, PhD candidate, University of Waterloo, Fall 2009 to present.

Student Projects and Theses Supervised:

- M. A. Graydon, University of Waterloo, “Quaternions and Quantum Theory,” Master’s thesis, Fall 2009 – Summer 2011.
- E. S. Gould, Perimeter Scholars International, “Searching for Noncovariant Symmetric Informationally Complete Quantum Measurements,” Master’s Research, Winter-Spring 2010–2011.
- A. Karlsson, Perimeter Scholars International, “Positive Operator Valued Measures, Frames and the Existence of Symmetric Informationally Complete Measurements,” Master’s Research, Winter-Spring 2010–2011.
- L. Piispanen, Perimeter Scholars International, “Symmetric Informationally Complete Positive Operator Valued Measures and Their Connections to the Weyl-Heisenberg Group,” Master’s Research, Winter-Spring 2010–2011.
- A. Fenyés, Perimeter Scholars International, “Maximal Consistent Sets and Non-Commutative Probability,” Master’s Research, Spring 2010.
- R. Morris, University of Waterloo, “New Ways to Express Quantum Dynamics,” Master’s Research, 2008 – 2009.
- Y. Shikano, Tokyo Institute of Technology, Japan, “Seeking SICs,” International Travel Scholarship, February–March 2008.
- H. B. Dang, California Institute of Technology and Princeton University, USA, “Quasi-Orthonormal Bases on the Cone of Positive Operators,” Bell Labs Summer Research Program, Summer 2006.
- M. Pérez-Suárez, University of Vigo, Spain, “Properties of Informationally Complete Measurements,” Communications Network Research Institute Visiting Ph. D. Student, Spring 2004.
- G. G. Plunk, Cornell University, USA, “Investigations on Informationally Complete Measurements,” Bell Labs Summer Research Program, Summer 2002.
- P. F. Scudo, Technion–Israel Institute of Technology, Israel, “Quantum de Finetti Representation Theorems for Completely Positive Maps,” DIMACS Graduate Research Fellowship, Spring 2002.
- F. Verstraete, Ghent University, Belgium, “Gleason-like Theorems for Entanglement and Completely Positive Maps,” DIMACS Graduate Research Fellowship, Spring 2002.
- J. M. Renes, University of New Mexico, USA, “Effect Algebras and the Quantum Probability Rule,” Summer Ph. D. Research, Summer 2001.
- R. A. Obajtek, Saint Louis University, USA, “Quantum Cryptography with Ternary Qutrit Alphabets,” Bell Labs Summer Research Program, Summer 2001.
- N. E. Baytch, Harvard University, USA, “Nonorthogonal Variations of Gleason’s Theorem in Quantum Mechanics,” Los Alamos National Laboratory Summer Intern Program, Summer 2000.
- P. Hayden, University of Oxford, England, “Distributing Quantum Information,” Los Alamos National Laboratory Visiting Student, April–May 2000.
- R. Schumann, University of Stellenbosch, South Africa, “Quantum Information Theory,” Master’s Thesis, Spring–Summer 2000.
- T. L. Poo, University of Oxford, England, “Entanglement–Information Relations in Quantum Information Processing,” Caltech Summer Undergraduate Research Fellowship, Summer 1998.
- J. A. Cortese, California Institute of Technology, USA, “Entanglement-Enhanced Classical Communication on the Amplitude Damping Channel,” beginning Ph. D. project, Spring–Summer 1997.

External Examiner for PhD Defense:

- B. Ibinson, “Quantum Information and Entropy,” University of Bristol, England, advisor A. Winter, 24 January 2008.
- Å. Ericsson, “Exploring the Set of Quantum States,” Stockholm University, Sweden, advisor I. Bengtsson, 17 August 2007.

Professional Affiliations:

American Physical Society (member)

Center for Discrete Mathematics & Theoretical Computer Science (permanent member)
International Quantum Structures Association (member)
Society for the Advancement of American Philosophy (member)
William James Society (member)

Foundations and Funding Agencies Advised:

John D. and Catherine T. MacArthur Foundation, USA
John Simon Guggenheim Memorial Foundation, USA
National Science Foundation, USA
European Science Foundation, EU
Austrian Academy of Sciences, Austria
Science Foundation Ireland, Republic of Ireland
Israel Science Foundation, Israel
Science and Technology Assistance Agency, Slovakia
Canadian Institute for Advanced Research, Canada
Netherlands Organisation for Scientific Research, The Netherlands
Fonds National Suisse de la Recherche Scientifique, Switzerland

Journals Refereed Over the Years:

American Journal of Physics; Annals of Physics; European Physical Journal D; Europhysics Letters; Foundations of Physics; IEEE Transactions on Information Theory; International Journal of Quantum Information; Journal of Applied Mathematics; Journal of Mathematical Physics; Journal of Modern Optics; Journal of Optics; Journal of Physics A; Nature; Open Systems & Information Dynamics; Physica Scripta; Physical Reviews A & E; Physical Review Letters; Physics Letters A; Physics Today; Quantum Information and Computation; Quantum Information Processing; Studies in History and Philosophy of Modern Physics

ARTICLES AND PUBLICATIONS:

All of my publications follow an alphabetical author-ordering convention with the exception of articles A42, A43, and B20 from my early student years, and the laboratory experiments reported in A2, A35, B2, B5, and B17.

A. Publications in Professional Journals and Reprint Collections

1. C. A. Fuchs and R. Schack, “Quantum-Bayesian Coherence,” to appear in *Reviews of Modern Physics*. Draft posted at [arXiv:1301.3274v1](https://arxiv.org/abs/1301.3274).
2. Z. E. D. Medendorp, F. A. Torres-Ruiz, L. K. Shalm, G. N. M. Tabia, C. A. Fuchs, and A. M. Steinberg, “Experimental Characterization of Qutrits Using Symmetric Informationally Complete Positive Operator-Valued Measurements,” *Physical Review A* **83**(5), 051801(R) (2011). [arXiv:1006.4905v1](https://arxiv.org/abs/1006.4905).
3. C. A. Fuchs, “QBism, the Perimeter of Quantum Bayesianism,” submitted to *Studies in History and Philosophy of Modern Physics*. [arXiv:1003.5209v1](https://arxiv.org/abs/1003.5209).
4. C. A. Fuchs, “Quantum Bayesianism at the Perimeter,” *Physics in Canada* **66**(2), 77–82 (2010). [arXiv:1003.5182v1](https://arxiv.org/abs/1003.5182).
5. D. M. Appleby, S. T. Flammia, and C. A. Fuchs, “The Lie Algebraic Significance of Symmetric Informationally Complete Measurements,” *Journal of Mathematical Physics* **52**(2), 022202 (2011). A significantly more detailed version posted at [arXiv:1001.0004v1](https://arxiv.org/abs/1001.0004).
6. D. M. Appleby, Å. Ericsson, and C. A. Fuchs, “Properties of QBist State Spaces,” *Foundations of Physics* **41**(3), 564–579 (2011). [arXiv:0910.2750v1](https://arxiv.org/abs/0910.2750).
7. C. A. Fuchs and R. Schack, “A Quantum-Bayesian Route to Quantum-State Space,” *Foundations of Physics* **41**(3), 345–356 (2011). [arXiv:0912.4252v1](https://arxiv.org/abs/0912.4252).
8. C. M. Caves, C. A. Fuchs, and R. Schack, “Subjective Probability and Quantum Certainty,” *Studies in History and Philosophy of Modern Physics* **38**(2), 255–274 (2007). [quant-ph/0608190](https://arxiv.org/abs/quant-ph/0608190).

9. C. A. Fuchs, M. Pérez-Suárez, and D. J. Santos, “Insights and Implications from a Bayesian Approach to Quantum Information,” *International Journal of Quantum Information* **3**(1), 233–237 (2005).
10. C. A. Fuchs, “On the Quantumness of a Hilbert Space,” *Quantum Information and Computation* **4**(6/7), 467–478 (2004). [Preprinted in *Quantum Information, Statistics, Probability: Dedicated to Alexander S. Holevo on the Occasion of His 60th Birthday*, edited by O. Hirota (Rinton Press, Princeton, NJ, 2004), pp. 65–77.] [quant-ph/0404122](#).
11. K. M. R. Audenaert, C. A. Fuchs, C. King, and A. Winter, “Multiplicativity of Accessible Fidelity and Quantumness for Sets of Quantum States,” *Quantum Information and Computation* **4**(1), 1–11 (2004). [quant-ph/0308120](#).
12. C. A. Fuchs, R. Schack, and P. F. Scudo, “A de Finetti Representation Theorem for Quantum Process Tomography,” *Physical Review A* **69**(6), 062305/1–6 (2004). [Reprinted in *Virtual Journal of Quantum Information* **4**(6).] [quant-ph/0307198](#).
13. C. M. Caves, C. A. Fuchs, K. K. Manne, and J. M. Renes, “Gleason-Type Derivations of the Quantum Probability Rule for Generalized Measurements,” *Foundations of Physics* **34**(2), 193–209 (2004). [quant-ph/0306179](#).
14. C. A. Fuchs and M. Sasaki, “Squeezing Quantum Information through a Classical Channel: Measuring the ‘Quantumness’ of a Set of Quantum States,” *Quantum Information and Computation* **3**(5), 377–404 (2003). [quant-ph/0302092](#).
15. C. A. Fuchs, “Quantum Mechanics as Quantum Information, Mostly,” *Journal of Modern Optics* **50**(6/7), 987–1023 (2003).
16. C. M. Caves, C. A. Fuchs, and R. Schack, “Conditions for Compatibility of Quantum-State Assignments,” *Physical Review A* **66**(6), 062111/1–11 (2002). [quant-ph/0206110](#).
17. S. J. van Enk and C. A. Fuchs, “Quantum State of a Propagating Laser Field,” *Quantum Information and Computation* **2**(2), 151–165 (2002). [quant-ph/0111157](#).
18. C. M. Caves, C. A. Fuchs and R. Schack, “Unknown Quantum States: The Quantum de Finetti Representation,” *Journal of Mathematical Physics* **43**(9), 4537–4559 (2002). [Reprinted in *Virtual Journal of Quantum Information* **2**(9); Erratum: *Journal of Mathematical Physics* **49**, 019902 (2008).] [quant-ph/0104088](#).
19. S. J. van Enk and C. A. Fuchs, “Quantum State of an Ideal Propagating Laser Field,” *Physical Review Letters* **88**(2), 027902/1–4 (2002). [quant-ph/0104036](#).
20. C. M. Caves, C. A. Fuchs and R. Schack, “Quantum Probabilities as Bayesian Probabilities,” *Physical Review A* **65**(2), 022305/1–6 (2002). [quant-ph/0106133](#).
21. S. L. Braunstein, C. A. Fuchs, H. J. Kimble, and P. van Loock, “Quantum versus Classical Domains for Teleportation with Continuous Variables,” *Physical Review A* **64**(2), 022321/1–16 (2001). [quant-ph/0012001](#).
22. C. M. Caves, C. A. Fuchs, and P. Rungta, “Entanglement of Formation of an Arbitrary State of Two Rebits,” *Foundations of Physics Letters* **14**(3), 199–212 (2001). [quant-ph/0009063](#).
23. C. A. Fuchs and K. Jacobs, “Information-Tradeoff Relations for Finite-Strength Quantum Measurements,” *Physical Review A* **63**(6), 062305/1–15 (2001). [quant-ph/0009101](#).
24. H. Barnum, C. M. Caves, C. A. Fuchs, R. Jozsa, and B. Schumacher, “On Quantum Coding for Ensembles of Mixed States,” *Journal of Physics A* **34**(35), 6767–6785 (2001). [quant-ph/0008024](#).
25. C. A. Fuchs and A. Peres, “Quantum Theory – Interpretation, Formulation, Inspiration: Fuchs and Peres Reply,” *Physics Today* **53**(9), 14, 90 (2000).
26. S. L. Braunstein, C. A. Fuchs, D. Gottesman, and H.-K. Lo, “A Quantum Analog of Huffman Coding,” *IEEE Transactions on Information Theory* **46**(4), 1644–1649 (2000). [quant-ph/9805080](#).
27. C. A. Fuchs and A. Peres, “Quantum Theory Needs No ‘Interpretation’,” *Physics Today* **53**(3), 70–71 (2000).
28. H. Barnum, C. M. Caves, J. Finkelstein, C. A. Fuchs, and R. Schack, “Quantum Probability from Decision Theory?,” *Proceedings of the Royal Society of London A* **456**, 1175–1182 (2000). [quant-ph/9907024](#).

29. J. R. Buck, S. J. van Enk, and C. A. Fuchs, “Experimental Proposal for Achieving Superadditive Communication Capacities with a Binary Quantum Alphabet,” *Physical Review A* **61**(3), 032309/1–7 (2000). [quant-ph/9903039](#).
30. S. L. Braunstein, C. A. Fuchs, and H. J. Kimble, “Criteria for Continuous-Variable Quantum Teleportation,” *Journal of Modern Optics* **47**(2/3), 267–278 (2000). [quant-ph/9910030](#).
31. C. H. Bennett, D. P. DiVincenzo, C. A. Fuchs, T. Mor, E. Rains, P. W. Shor, J. A. Smolin, and W. K. Wootters, “Quantum Nonlocality without Entanglement,” *Physical Review A* **59**(2), 1070–1091 (1999). [quant-ph/9804053](#).
32. C. A. Fuchs and J. van de Graaf, “Cryptographic Distinguishability Measures for Quantum Mechanical States,” *IEEE Transactions on Information Theory* **45**(4), 1216–1227 (1999). [quant-ph/9712042](#).
33. D. P. DiVincenzo, C. A. Fuchs, H. Mabuchi, J. A. Smolin, A. Thapliyal, and A. Uhlmann, “Entanglement of Assistance” *Lecture Notes in Computer Science* **1509**, 247–257 (1999). [quant-ph/9803033](#).
34. C. A. Fuchs, “Information Gain vs. State Disturbance in Quantum Theory,” *Fortschritte der Physik* **46**(4,5), 535–565 (1998). [Reprinted in *Quantum Computation: Where Do We Want to Go Tomorrow?*, edited by S. L. Braunstein (Wiley–VCH Verlag, Weinheim, 1999), pp. 229–259.] [quant-ph/9611010](#).
35. A. Furusawa, J. L. Sørensen, S. L. Braunstein, C. A. Fuchs, H. J. Kimble, and E. S. Polzik, “Unconditional Quantum Teleportation,” *Science* **282**(5389), 706–709 (1998). [This article was listed in *Science* as one of the top ten “breakthroughs of the year” in 1998; see *Science* **282**(5397), 2156–2161 (1998).]
36. D. Bruß, D. P. DiVincenzo, A. Ekert, C. A. Fuchs, C. Macchiavello, and J. A. Smolin, “Optimal Universal and State-Dependent Quantum Cloning,” *Physical Review A* **57**(4), 2368–2378 (1998). [quant-ph/9705038](#).
37. C. A. Fuchs, “Nonorthogonal Quantum States Maximize Classical Information Capacity,” *Physical Review Letters* **79**(6), 1162–1165 (1997). [Reprinted in *Quantum Information and Quantum Computation*, edited by C. Macchiavello, G. M. Palma, and A. Zeilinger (World Scientific, Singapore, 2000), pp. 207–210.] [quant-ph/9703043](#).
38. C. A. Fuchs, N. Gisin, R. B. Griffiths, C.-S. Niu, and A. Peres, “Optimal Eavesdropping in Quantum Cryptography. I. Information Bound and Optimal Strategy,” *Physical Review A* **56**(2), 1163–1172 (1997). [quant-ph/9701039](#).
39. H. Barnum, C. A. Fuchs, R. Jozsa, and B. Schumacher, “General Fidelity Limit for Quantum Channels,” *Physical Review A* **54**(6), 4707–4711 (1996). [quant-ph/9603014](#).
40. C. A. Fuchs and A. Peres, “Quantum State Disturbance vs. Information Gain: Uncertainty Relations for Quantum Information,” *Physical Review A* **53**(4), 2038–2045 (1996). [quant-ph/9512023](#).
41. H. Barnum, C. M. Caves, C. A. Fuchs, R. Jozsa, and B. Schumacher, “Noncommuting Mixed States Cannot Be Broadcast,” *Physical Review Letters* **76**(15), 2818–2821 (1996). [Reprinted in *Quantum Information and Quantum Computation*, edited by C. Macchiavello, G. M. Palma, and A. Zeilinger (World Scientific, Singapore, 2000), pp. 195–198.] [quant-ph/9511010](#).
42. C. A. Fuchs and C. M. Caves, “Mathematical Techniques for Quantum Communication Theory,” *Open Systems & Information Dynamics* **3**(3), 345–356 (1995). [quant-ph/9604001](#).
43. C. A. Fuchs and C. M. Caves, “Ensemble-Dependent Bounds for Accessible Information in Quantum Mechanics,” *Physical Review Letters* **73**(23), 3047–3050 (1994).
44. H. Barnum, C. M. Caves, C. Fuchs, and R. Schack, “Comment on J. Lebowitz, ‘Boltzmann’s Entropy and Time’s Arrow’,” *Physics Today* **47**(11), 11–13 (1994).
45. C. Fuchs, “Aharonov-Casher Effect in Massive-Photon Electrodynamics,” *Physical Review D* **42**(8), 2940–2942 (1990).

B. Publications in Books and Conference Proceedings

1. C. A. Fuchs, “Charting the Shape of Quantum-State Space,” in *Quantum Communication, Measurement and Computing (QCMC): The Tenth International Conference*, edited by T. Ralph and P. K. Lam, AIP Conference Proceedings Vol. 1363, (American Institute of Physics, Melville, NY, 2011), pp. 305–314.

2. Z. E. D. Medendorp, F. A. Torres-Ruiz, L. K. Shalm, G. N. M. Tabia, C. A. Fuchs, and A. M. Steinberg, “Experimental Characterization of Qutrits Using Symmetric, Informationally Complete Positive Operator-Valued Measurements,” in *International Conference on Applications of Optics and Photonics, Braga, Portugal, 3 May 2011*, edited by M. F. Costa, *Proceedings of SPIE* **8001**, article 80011B (2011).
3. C. A. Fuchs and R. Schack, “Bayesian Conditioning, the Reflection Principle, and Quantum Decoherence,” in *Probability in Physics*, edited by Y. Ben-Menahem and M. Hemmo (Springer, Berlin, Frontiers Collection, 2012), pp. 233–247. [arXiv:1103.5950v1](#).
4. C. A. Fuchs, “Interview with a Quantum Bayesian,” in *Elegance and Enigma: The Quantum Interviews*, edited by M. Schlosshauer (Springer, Berlin, Frontiers Collection, 2011). [arXiv:1207.2141v1](#).
5. Z. E. D. Medendorp, F. A. Torres-Ruiz, L. K. Shalm, C. A. Fuchs, and A. M. Steinberg, “Characterizing a Qutrit Directly with Symmetric Informationally Complete (SIC) POVMs,” *QELS 2010, The Quantum Electronics and Laser Science Conference, 16–21 May 2010*, OSA Technical Digest (CD) (Optical Society of America, 2010), paper QFF4.
6. C. A. Fuchs and R. Schack, “From Quantum Interference to Bayesian Coherence and Back Round Again,” in *Foundations of Probability and Physics – 5*, edited by L. Accardi et al., AIP Conference Proceedings Vol. 1101, (American Institute of Physics, Melville, NY, 2009), pp. 260–279.
7. C. A. Fuchs and R. Schack, “Priors in Quantum Bayesian Inference,” in *Foundations of Probability and Physics – 5*, edited by L. Accardi et al., AIP Conference Proceedings Vol. 1101, (American Institute of Physics, Melville, NY, 2009), pp. 255–259. [arXiv:0906.1714v1](#).
8. C. A. Fuchs, “Delirium Quantum: Or, where I will take quantum mechanics if it will let me,” in *Foundations of Probability and Physics – 4*, edited by G. Adenier, C. A. Fuchs, and A. Yu. Khrennikov, AIP Conference Proceedings Vol. 889, (American Institute of Physics, Melville, NY, 2007), pp. 438–462. [arXiv:0906.1968v1](#).
9. C. A. Fuchs and R. Schack, “Unknown Quantum States and Operations, a Bayesian View,” in *Quantum Estimation Theory*, edited by M. G. A. Paris and J. Řeháček (Springer-Verlag, Berlin, 2004), pp. 151–190. [quant-ph/0404156](#).
10. C. A. Fuchs and M. Sasaki, “The Quantumness of a Set of Quantum States,” in *Proceedings of the Sixth International Conference on Quantum Communication, Measurement and Computing*, edited by J. H. Shapiro and O. Hirota (Rinton Press, Princeton, NJ, 2003), pp. 475–480. [quant-ph/0302108](#).
11. C. A. Fuchs, “Quantum Mechanics as Quantum Information (and only a little more),” in *Quantum Theory: Reconsideration of Foundations*, edited by A. Khrennikov (Växjö University Press, Växjö, Sweden, 2002), pp. 463–543. [quant-ph/0205039](#).
12. C. A. Fuchs, “The Anti-Växjö Interpretation of Quantum Mechanics,” in *Quantum Theory: Reconsideration of Foundations*, edited by A. Khrennikov (Växjö University Press, Växjö, Sweden, 2002), pp. 99–116. [quant-ph/0204146](#).
13. C. A. Fuchs, “Quantum Foundations in the Light of Quantum Information,” in *Decoherence and its Implications in Quantum Computation and Information Transfer: Proceedings of the NATO Advanced Research Workshop, Mykonos Greece, June 25–30, 2000*, edited by A. Gonis and P. E. A. Turchi (IOS Press, Amsterdam, 2001), pp. 38–82. [quant-ph/0106166](#).
14. C. A. Fuchs, “Quantum Channels,” in *Quantum Information and Quantum Computation: Reprint Volume with Introductory Notes for ISI TMR Network School*, edited by C. Macchiavello, G. M. Palma, and A. Zeilinger (World Scientific, Singapore, 2000), pp. 157–160.
15. C. A. Fuchs, “Just *Two* Nonorthogonal Quantum States,” in *Quantum Communication, Computing, and Measurement 2*, edited by P. Kumar, G. M. D’Ariano, and O. Hirota (Kluwer, Dordrecht, 2000), pp. 11–16. [quant-ph/9810032](#).
16. S. J. van Enk and C. A. Fuchs, “Entanglement Is Super . . . But Not Superluminal,” in *Instantaneous Action at a Distance in Modern Physics: “Pro” and “Contra”*, edited by A. E. Chubykalo, V. Pope, and R. Smirnov-Rueda (Nova Science Publishers, Commack, NY, 1999), pp. 407–411.
17. H. J. Kimble, J. Buck, C. Fuchs, A. Furusawa, C. Hood, H. Mabuchi, T. Lynn, Sørensen, Q. Turchette, S. van Enk, D. Vernooy, and J. Ye, “Quantum Communication and Computation in Quantum Optics ,”

Quantum Electronics and Laser Science Conference, 1999 (QELS '99), 3–28 May 1999, OSA Technical Digest (CD) (Optical Society of America, 1999), paper QWA1.

18. S. L. Braunstein, C. A. Fuchs, D. Gottesman, and H.-K. Lo, “A Quantum Analog of Huffman Coding,” in *Proceedings 1998 IEEE International Symposium on Information Theory (MIT, Cambridge, MA USA, 16–21 August 1998)*, (IEEE Information Theory Society, Cambridge, MA, 1998), p. 353.
19. C. H. Bennett, C. A. Fuchs, and J. A. Smolin, “Entanglement-Enhanced Classical Communication on a Noisy Quantum Channel,” in *Quantum Communication, Computing and Measurement*, edited by O. Hirota, A. S. Holevo, and C. M. Caves (Plenum Press, NY, 1997), pp. 79–88. [quant-ph/9611006](#).
20. C. A. Fuchs, “Information Gain vs. State Disturbance in Quantum Theory,” in *PhysComp96: Proceedings of the Fourth Workshop on Physics and Computation (Boston University, 22–24 November 1996)*, edited by T. Toffoli, M. Biafore, and J. Leão (New England Complex Systems Institute, Cambridge, MA, 1996), pp. 122–126. [quant-ph/9605014](#).
21. C. M. Caves and C. A. Fuchs, “Quantum Information: How Much Information in a State Vector?,” in *The Dilemma of Einstein, Podolsky and Rosen – 60 Years Later (An International Symposium in Honour of Nathan Rosen – Haifa, March 1995)*, edited by A. Mann and M. Revzen, *Annals of The Israel Physical Society* **12**, 226–257 (1996). [quant-ph/9601025](#).
22. C. A. Fuchs and C. M. Caves, “Bounds for Accessible Information in Quantum Mechanics,” in *Fundamental Problems in Quantum Theory: A Conference Held in Honor of Professor John A. Wheeler*, edited by D. Greenberger and A. Zeilinger, *Annals of the New York Academy of Sciences* **755**, pp. 706–715 (1995).
23. C. Fuchs, “Landauer’s Principle and Black-Hole Entropy,” in *Workshop on Physics and Computation: PhysComp '92*, edited by D. Matzke (IEEE Computer Society, Los Alamitos, CA, 1993), pp. 86–92.
24. C. Fuchs, “Lagrangian Formulation of LAGEOS Spin Dynamics,” in *Proceedings of the Air Force Office of Scientific Research Summer Research Program 1992*, (AFOSR, Washington, DC, 1992).
25. C. Fuchs, “Algorithmic Information Theory and the Hidden Variable Question,” in *Workshop on Squeezed States and Uncertainty Relations, NASA Conference Publication 3135*, edited by D. Han, Y. S. Kim, and W. W. Zachary (NASA, Washington, DC, 1992), pp. 83–85.

C. Books

1. C. A. Fuchs, *Coming of Age with Quantum Information: Notes on a Paulian Idea*, (Cambridge University Press, Cambridge, UK, 2010).
2. C. A. Fuchs, *Notes on a Paulian Idea: Foundational, Historical, Anecdotal & Forward-Looking Thoughts on the Quantum*, with foreword by N. David Mermin, (Växjö University Press, Växjö, Sweden, 2003). 718 pages. Also published in a 508-page format as [quant-ph/0105039](#).

D. Books and Special Issues Edited

1. H. Atmanspacher and C. A. Fuchs, editors, *The Pauli-Jung Conjecture and Its Impact Today*, (Imprint Academic, Devon, UK, 2013).
2. L. Accardi, G. Adenier, C. A. Fuchs, G. Jaeger, A. Yu. Khennikov, J. Å. Larsson, and S. Stenholm, editors, *Foundations of Probability and Physics – 5, Växjö, Sweden, 24–27 August 2008*, AIP Conference Proceedings Vol. 1101, (American Institute of Physics, Melville, NY, 2009).
3. G. Adenier, C. A. Fuchs, and A. Yu. Khrennikov, editors, *Foundations of Probability and Physics – 4, Växjö, Sweden, 4–9 June 2006*, AIP Conference Proceedings Vol. 889, (American Institute of Physics, Melville, NY, 2007).
4. C. A. Fuchs, editor, Festschrift for Asher Peres’s 70th Birthday, *Foundations of Physics* **35**(11,12), (2005) and **36**(1), (2006).
5. J. Bub and C. A. Fuchs, editors, Special Issue on Quantum Information and Computation, *Studies in History and Philosophy of Modern Physics* **34**(3), (2003).

E. Other Book-Length Documents

1. C. A. Fuchs, *Distinguishability and Accessible Information in Quantum Theory*, PhD thesis, University of New Mexico, Albuquerque, NM (1996). 174 pages. [quant-ph/9601020](#).

2. C. A. Fuchs, *Quantum States: What the Hell Are They?*, 229 pages, available at <http://www.perimeterinstitute.ca/personal/cfuchs/>.
3. C. A. Fuchs, *My Struggles with the Block Universe*, 1,770 pages, incomplete draft, available at <http://www.perimeterinstitute.ca/personal/cfuchs/> (listed presently as “Cerro Grande II”).

F. Book Reviews, Essays, Blurbs, Brief Radio and Film Appearances, Etc.

1. C. A. Fuchs, “March Meeting in the Lone Star State,” *The Quantum Times* **5**(3), 1–2 (2011).
2. C. A. Fuchs, “Letter from the Incoming Chair,” *The Quantum Times* **5**(3), 1–2 (2011).
3. C. A. Fuchs, “Praise for ‘Quantum Computation and Quantum Information,’” (with S. Aaronson, R. Blatt, D. P. DiVincenzo, and L. Grover) on back cover of *Quantum Computation and Quantum Information, 10th Anniversary Edition*, by M. A. Nielsen and I. L. Chuang, (Cambridge University Press, Cambridge, UK, 2010).
4. C. A. Fuchs, radio interview, *The Science Show* with Robyn Williams (ABC Radio International), 10 April 2010, <http://www.abc.net.au/rn/scienceshow/>.
5. C. A. Fuchs, “QBism House Opens for Business,” *Inside the Perimeter* **7**(9), 7 (2009).
6. C. A. Fuchs, “Advance Praise for ‘Q-PSI,’” (with M. A. Nielsen, J. Preskill, and W. K. Wootters) on back cover of *Quantum Processes, Systems, and Information*, by B. Schumacher and M. Westmoreland, (Cambridge University Press, Cambridge, UK, 2010).
7. C. A. Fuchs, video interview, *Meet a Scientist* series, [http://www.perimeterinstitute.ca/Outreach/Students/Meet a Scientist/](http://www.perimeterinstitute.ca/Outreach/Students/Meet%20a%20Scientist/), (2009).
8. C. A. Fuchs, brief appearance in *The Challenge of Quantum Reality*, Perimeter Explorations 02, (2009).
9. C. A. Fuchs and J.-Å. Larsson, “Foreword: Unperformed Experiments Have No Results,” in *Foundations of Probability and Physics – 5*, edited by L. Accardi et al., AIP Conference Proceedings Vol. 1101, (American Institute of Physics, Melville, NY, 2009), pp. 221–222.
10. C. A. Fuchs, “Seeking SICs: An Intense Workshop on Quantum Frames and Designs,” *Inside the Perimeter* **6**(10), 5 (2008).
11. C. A. Fuchs, “Osamu Hirota: A True Quantum Communications Channel,” *Inside the Perimeter* **6**(8), 6 (2008).
12. C. A. Fuchs, “Swedish Bayesian Team,” in *Foundations of Probability and Physics – 4*, edited by G. Adenier, C. A. Fuchs, and A. Yu. Khrennikov, AIP Conference Proceedings Vol. 889, (American Institute of Physics, Melville, NY, 2007), pp. xi–xii.
13. C. A. Fuchs, “Asher Peres,” *Foundations of Physics* **35**(11), 1785–1786 (2005).
14. M. Arndt, M. Aspelmeyer, H. J. Bernstein, R. Bertlmann, C. Brukner, J. P. Dowling, J. Eisert, A. Ekert, C. A. Fuchs, D. M. Greenberger, M. A. Horne, T. Jennewein, P. G. Kwiat, N. D. Mermin, J.-W. Pan, E. M. Rasel, H. Rauch, T. G. Rudolph, C. Salomon, A. V. Sergienko, J. Schmiedmayer, C. Simon, V. Vedral, P. Walther, G. Weihs, P. Zoller, M. Zukowski, “Quantum Physics from A to Z,” in *Proceedings of the Quantum Physics of Nature (QUPON) Conference, Vienna, Austria, May 22nd-26th, 2005*, edited by M. Arndt and G. Weihs. [arXiv:quant-ph/0505187v4](https://arxiv.org/abs/quant-ph/0505187v4).
15. C. A. Fuchs, “Advance Praise for ‘Converging Realities,’” (with R. Torretti) on back cover of *Converging Realities: Toward a Common Philosophy of Physics and Mathematics*, by R. Omnès, (Princeton University Press, Princeton, 2005).
16. C. A. Fuchs, “Soul-Searching at Caltech,” *Physics World* (November, 2003), p. 49.
17. C. A. Fuchs, “Book Review on ‘Statistical Structure of Quantum Theory,’ by Alexander S. Holevo,” *Quantum Information and Computation* **3**(2), 191–192 (2003).
18. J. Bub and C. A. Fuchs, “Introduction: Special Issue on Quantum Information and Computation,” *Studies in History and Philosophy of Modern Physics* **34**(3), 339–341 (2003).
19. C. A. Fuchs, brief appearance in The History Channel’s *History’s Mysteries*, episode titled “True Story of the Philadelphia Experiment,” originally aired 12 March 2001.

G. Published Abstracts

1. D. M. Appleby, H. B. Dang, and C. A. Fuchs, “SIC-POVMs and Lie Algebras,” *Bulletin of the American Physical Society* **57**(1), J29 (2012).
2. D. M. Appleby, I. Bengtsson, K. Blanchfield, Å. Ericsson, H. B. Dang, C. A. Fuchs, M. A. Graydon, and G. N. Tabia, “A Linear Dependency Structure Arising from Weyl-Heisenberg Symmetry,” *Bulletin of the American Physical Society* **56**(1), J29 (2011).
3. D. M. Appleby, H. B. Dang, and C. A. Fuchs, “Symmetric Informationally-Complete States Are Minimum Uncertainty States in Prime Dimensions,” *Bulletin of the American Physical Society* **55**(2), Y33 (2010).
4. C. A. Fuchs, “Quantum Bayesian Coherence,” *Bulletin of the American Physical Society* **55**(2), X33 (2010).
5. D. M. Appleby, H. B. Dang, and C. A. Fuchs, “Quasi-Orthonormal Bases for the Space of Density Operators,” *Bulletin of the American Physical Society* **52**(1), B33 (2007).
6. C. A. Fuchs, “Quantum Mechanics in Terms of Symmetric Measurements,” *Bulletin of the American Physical Society* **51**(1), D40 (2006).
7. C. A. Fuchs, “The Fragility and Resilience of Quantum Information,” *Bulletin of the American Physical Society* **44**(10), AA.02 (1999).
8. M. Ban, C. A. Fuchs, O. Hirota, M. Osaki, and M. Sasaki, “Some Problems in Quantum Channel Capacity for Shannon Information,” in *Quantum Algorithms: Dagstuhl Seminar Report 210*, edited by T. Beth and G. Brassard (Internationales Begegnungs- und Forschungszentrum für Informatik (IBFI), Wadern, Germany, 1998), p. 19.

H. Further Archived Materials

1. C. A. Fuchs and R. Schack, “Quantum-Bayesian Coherence,” [arXiv:0906.2187v1](https://arxiv.org/abs/0906.2187v1); this is a longer, more philosophical version of [arXiv:1301.3274v1](https://arxiv.org/abs/1301.3274v1).
2. D. M. Appleby, H. B. Dang, and C. A. Fuchs, “Symmetric Informationally-Complete Quantum States as Analogues to Orthonormal Bases and Minimum-Uncertainty States,” [arXiv:0707.2071v2](https://arxiv.org/abs/0707.2071v2).
3. H. Barnum, C. A. Fuchs, J. M. Renes, and A. Wilce, “Influence-Free States on Compound Quantum Systems,” [arXiv:quant-ph/0507108v1](https://arxiv.org/abs/quant-ph/0507108v1).
4. C. A. Fuchs, “The Structure of Quantum Information,” available at <http://www.perimeterinstitute.ca/personal/cfuchs/>.
5. C. A. Fuchs, “578 References for Research in Quantum Distinguishability and State Disturbance,” available at <http://www.perimeterinstitute.ca/personal/cfuchs/>.

I. Articles in Preparation

(Preliminary drafts available upon request.)

1. C. A. Fuchs, N. D. Mermin, and R. Schack, “Against Nonlocality” to be submitted to *American Journal of Physics*.
2. C. A. Fuchs and R. Schack, “Quantum Decoherence as van Fraassen’s Reflection Principle in Disguise,” to be submitted to *Physical Review A*.
3. C. A. Fuchs, “The Quantum Foundational Roots of Quantum Information,” to be submitted to *Physics Today*.
4. C. A. Fuchs, “The Activating Observer: Resource Material for a Paulian–Wheelerish Conception of Nature,” presently 194 pages, to be submitted somewhere as a monograph.

INVITED LECTURES AND SEMINARS:

To the present date, I have given over 175 invited lectures and seminars. Beyond traveling through or over most states in the United States, this has allowed me the opportunity to visit Australia, Austria,

Belgium, Canada, China, Denmark, England, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Japan, Mexico, The Netherlands, New Zealand, Northern Ireland, Poland, Portugal, Scotland, South Africa, Spain, Sweden, Switzerland, and Wales. This is my tribute to my stepfather W. T. Spears, who would say, “Chris, travel is the best form of education.”

A. Expository, Tutorial, and Summer-School Talks (selected)

Asher Peres International School for Theoretical Physics, Chowder Bay, Sydney, Australia, 17–21 November 2008, “Quantum Foundations, Asher Peres Style.”

“The Physics of Information: What the Universe Doesn’t Want You to Know,” a panel discussion with Sir Anthony Leggett, Seth Lloyd, and Leonard Susskind. Perimeter Institute Public Lecture, 17 December 2007; aired on CBC Radio 1 as episode of *Quirks and Quarks with Bob McDonald*, 5 January 2008. Available for viewing at <http://pirsa.org/>; also available on DVD from Perimeter Institute.

Quantum Foundations Summer School, Perimeter Institute for Theoretical Physics, Waterloo, Canada, 27–31 August 2007, “Quantum States as Uncertainty, pure and simple. But, Uncertainty about What?” Available for viewing at <http://pirsa.org/>.

Squire Public Lecture, Grinnell College, Grinnell, Iowa, 3 May 2006, “Quantum Information and the Reactive World.”

Computing Beyond Silicon Summer School 2004, California Institute of Technology, Pasadena, California, 16–18 June 2004, “Introduction to Quantum Mechanics” and “Quantum Cryptography.”

Instructional Course in Quantum Computing, Edinburgh, Scotland, 27–31 March 2000, course on “Quantum Communication.”

TMR Network School on Quantum Computation and Quantum Information Theory, Villa Gualino, Turin, Italy, 12–23 July 1999, course on “Quantum Channels.”

Physics Colloquium, Amherst College, Amherst, Massachusetts, 2 April 1999, “Quantum Teleportation: Using Entanglement as a Resource.”

Physics Colloquium, Case Western Reserve University, Cleveland, Ohio, 5 February 1998, “Quantum Entanglement: What Good Is It?”

Michelson Lecture Series, Case Western Reserve University, Cleveland, Ohio, 2-6 February 1998, lectures on “Quantum Information Theory.”

DIMACS Quantum Computing Tutorial and Workshop, Princeton University, Princeton, New Jersey, 11–15 August 1997, tutorials on “Basic Quantum Mechanics” and “Sending Classical Information on Quantum Channels.”

B. Invited Research Talks (selected)

Workshop on the Mathematical Methods of Quantum Tomography, The Fields Institute for Research in Mathematical Sciences, Toronto, Canada, 19–22 February 2013 (scheduled).

Do We Need a Physics of ‘Passage’?, Cape Town, South Africa, 10–14 December 2012 (had to cancel).

Joint Philosophy-Physics Colloquium, University of Queensland, Brisbane, Australia, 9 November 2012.

European Science Foundation Programme “The Philosophy of Science in a European Perspective” Final Conference, Bologna, Italy, 20 October 2012. (I was invited as one of the “three senior philosophers of physics / natural sciences” to present at the meeting.)

Symposium on Foundations of Quantum Mechanics, Joint Quantum Institute, University of Maryland and National Institute of Standards and Technology (NIST), College Park, Maryland, 10 October 2012.

Colloquium, Institute for Quantum Computing, University of Waterloo, Waterloo, Canada, 10 September 2012.

2012 Karles Invitational Conference: Quantum Information Science and Technology, Naval Research Laboratory, Washington, DC, 27 August 2012.

Quantum Information Seminar, MIT Lincoln Laboratory, Lexington, Massachusetts, 23 July 2012.

Physics and Applied Physics Departments Colloquium, Stanford University, Stanford, California, 22 May 2012.

National Institute for Theoretical Physics (NITheP) Seminar, Stellenbosch, South Africa, 18 April 2012.

Fellows' Seminar, Stellenbosch Institute for Advanced Study (STIAS), Stellenbosch, South Africa, 12 April 2012.

Physics Department Colloquium, Dartmouth College, Hanover, New Hampshire, 11 November 2011.

Foundations of Quantum Theory: Measurement, the Quantum to Classical Transition, and the Flow of Time, Stellenbosch, South Africa, 26 October 2011.

Physics Department Colloquium, Michigan Technological University, Houghton, Michigan, 22 September 2011.

Colloquium, Joint Quantum Institute, University of Maryland and National Institute of Standards and Technology (NIST), College Park, Maryland, 14 September 2011.

Quantum Physics and the Nature of Reality, International Academy, Traunkirchen, Austria, 4 July 2011.

Keynote Speaker, Fifth International Quantum Interactions Symposium, Aberdeen, Scotland, 27 June 2011.

Quantum States: Ontic or Epistemic?, University of Aberdeen, Aberdeen, Scotland, 26 June 2011.

Foundations of Probability and Physics – 6, Linnaeus University, Växjö, Sweden, 14 June 2011.

Conceptual Foundations and Foils for Quantum Information Processing, Perimeter Institute for Theoretical Physics, Waterloo, Canada, 10 May 2011.

Difficult Problems in Quantum Information Theory II, Massachusetts Institute of Technology, Cambridge, Massachusetts, 3 May 2011.

Clifford Lectures, Tulane University, New Orleans, Louisiana, 14–17 March 2011.

Itamar Pitowsky Memorial Lecture, Hebrew University, Jerusalem, Israel, 16 February 2011.

Stellenbosch Institute for Advanced Study (STIAS), Stellenbosch, South Africa, 2–11 November 2010.

NORDITA Workshop on the Foundations of Quantum Mechanics, Stockholm, Sweden, 27 September – 1 October 2010.

Quantum Physics in Higher-Dimensional Hilbert Spaces, International Academy, Traunkirchen, Austria, 29 July 2010.

Tenth International Conference on Quantum Communication, Measurement and Computation (QCMC 2010), University of Queensland, Brisbane, Australia, 20 July 2010.

Advances in Quantum Theory, Linnaeus University, Växjö, Sweden, 14 June 2010.

Fundamentals of Physics and Information, ETH, Zurich, Switzerland, 11 June 2010.

Physics Colloquium, University of North Carolina, Chapel Hill, North Carolina, 20 April 2010.

Colloquium, Perimeter Institute for Theoretical Physics, Waterloo, Canada, 10 March 2010.

Nagoya Winter Workshop on Quantum Information, Measurement, and Foundations, Nagoya, Japan, 20 February 2010.

IQQI Seminar, University of Vienna, Vienna, Austria, 18 January 2010.

Philosophy of Science Seminar, University of Toronto, Toronto, Canada, 29 October 2009.

Physics Department Colloquium, University of Guelph, Guelph, Canada, 20 October 2009.

Second Annual Workshop on Informatic Phenomena, Tulane University, New Orleans, Louisiana, 8 October 2009.

Reconstructing Quantum Theory, Perimeter Institute for Theoretical Physics, Waterloo, Canada, 13 August 2009.

Quantum Theory: Reconsideration of Foundations – 5, Växjö, Sweden, 17 June 2009.

Philosophy of Science Colloquium, University of Western Ontario, London, Canada, 20 May 2009.

Joint Physics and Philosophy Colloquium, University of Rochester, Rochester, New York, 25 March 2009.

Workshop on Informatic Phenomena, Tulane University, New Orleans, Louisiana, 16 October 2008.

Seminar, Inst. für Grenzgebiete der Psychologie und Psychohygiene, Freiburg, Germany, 30 July 2008.

Seminar, Max Planck Institute for Quantum Optics, Garching, Germany, 28 July 2008.

Perspectives in Physics and Philosophy, Carré des Sciences, Paris, France, 19 June 2008.

Information Primitives and the Laws of Nature, Zurich, Switzerland, 15 May 2008.

Physics Colloquium, McMaster University, Hamilton, Ontario, Canada, 9 April 2008.

Physics Colloquium, University of Oregon, Eugene, Oregon, 28 February 2008.

PIAF Workshop in Quantum Foundations, Sydney, Australia, 3 February 2008.

Mathematics Seminar, University of Bristol, England, 25 January 2008.

Colloquium, Perimeter Institute for Theoretical Physics, Waterloo, Canada, 16 January 2008.

Computer Science Seminar, Tsinghua University, Beijing, China, 7 November 2007.

Many Worlds at 50, Perimeter Institute for Theoretical Physics, Waterloo, Canada, 24 August 2007.

Workshop on Operational Probabilistic Theories as Foils to Quantum Theory, University of Cambridge, England, 11 July 2007.

Vienna Symposium on the Foundations of Modern Physics, Vienna, Austria, 9 June 2007.

Mathematics Seminar, Susquehanna University, Selinsgrove, Pennsylvania, 21 March 2007.

Pragmatisme et Mécanique Quantique, École Polytechnique, Paris, France, 23 February 2007.

Physics Colloquium, State University of New York, Albany, New York, 10 November 2006.

Quantum Reality, Relativistic Causality, and Closing the Epistemic Circle: An International Conference, Perimeter Institute for Theoretical Physics, Waterloo, Canada, 22 July 2006.

Workshop on Quantum Mechanics: Axiomatics of Measurements and Connections with Computing and Information Retrieval, University of Pavia, Pavia, Italy, 25 June 2006.

Quantum Computation and Information Seminar, Center for Logic and Computation, Technical University of Lisbon, Lisbon, Portugal, 31 March 2006.

Applied Mathematics Colloquium, Princeton University, Princeton, New Jersey, 20 February 2006.

36th Winter Colloquium on The Physics of Quantum Electronics, Snowbird, Utah, 5 January 2006.

Physics Colloquium, College of William and Mary, Williamsburg, Virginia, 28 October 2005.

Physics Colloquium, Dartmouth College, Hanover, New Hampshire, 30 September 2005.

Twenty-Fifth International Workshop on Bayesian Inference and Maximum Entropy Methods in Science and Engineering, San Jose, California, 11 August 2005.

Quantum Information, Computation and Logic: Exploring New Connections, Perimeter Institute for Theoretical Physics, Waterloo, Canada, 19 July 2005.

J. T. Lewis Memorial Conference on Mathematics and Applications, Dublin, Ireland, 13 June 2005.

Quantum Theory: Reconsideration of Foundations – 3, Växjö, Sweden, 4 June 2005.

Quantum Physics of Nature & The 6th European Quantum Information Processing and Communication (QIPC) Workshop, Vienna, Austria, 23 May 2005.

AMO Physics Seminar, University of Toronto, Toronto, Canada, 5 April 2005.

II Sympozjum LFPPI Informatyki I Inżynierii Kwantowej, Wrocław University of Technology, Wrocław, Poland, 4 March 2005.

Philosophy of Science Seminar, University of Maryland, College Park, Maryland, 16 December 2004.

Quantum Physics Seminar, New York University, New York, New York, 13 December 2004.

Summer Workshop: Time-Asymmetry and Quantum Reality, Sydney, Australia, 4 December 2004.

Philosophy of Science Association Annual Meeting, Austin, Texas, 20 November 2004.

Quantum Physics Seminar, New York University, New York, New York, 15 November 2004.

Seven Pines Symposium VIII: Quantum Mechanics, Quantum Information, and Quantum Computation, Minneapolis, Minnesota, 7 May 2004.

New Directions in the Foundations of Physics, American Institute of Physics, College Park, Maryland, 30 April 2004.

Seminar, Institut für Grenzgebiete der Psychologie und Psychohygiene, Freiburg, Germany, 1 April 2004.

Physics Colloquium, University of British Columbia, Vancouver, Canada, 11 March 2004.

Physics Colloquium, National University of Ireland, Maynooth, Ireland, 5 March 2004.

Philosophy of Physics Research Seminar, Oxford University, Oxford, England, 19 February 2004.

Probability in Quantum Mechanics, London School of Economics, London, England, 16 February 2004.

AMO Physics Seminar, Niels Bohr Institute for Astronomy, Physics, and Geophysics, University of Copenhagen, Copenhagen, Denmark, 2 February 2004.

Seminaire du Constitutions d'Objectivite, Centre de Recherches en Epistémologie Appliqué, Paris, France, 8 December 2003.

European Science Foundation Conference on Philosophical and Foundational Issues in Statistical Physics, Utrecht, Netherlands, 30 November 2003.

Physics Colloquium, Perimeter Institute for Theoretical Physics, Waterloo, Canada, 19 November 2003.

Institute for Quantum Information Seminar Series, California Institute of Technology, Pasadena, California, 15 October 2003.

Workshop on Quantum Measurements and Quantum Stochastics, University of Aarhus, Aarhus, Denmark, 7 August 2003.

Dublin Theoretical Physics Colloquium, Trinity College, Dublin, Ireland, 6 October 2003.

Mathematical Analysis of Quantum Systems, Dublin Institute for Advanced Studies, Dublin, Ireland, 2 October 2003.

Quantum Mechanics On The Large Scale Exploratory Workshop, Peter Wall Institute of Advanced Studies, University of British Columbia, Vancouver, Canada, 21 April 2003.

Communication Networks Research Institute, Dublin Institute of Technology, Dublin, Ireland, 27 March 2003.

Physics Colloquium, City College of New York, New York, 4 December 2002. University of Copenhagen Mathematics Department Seminar, Copenhagen, Denmark, 13 September 2002.

International Center for Mathematical Modeling Center, Växjö University, Växjö, Sweden, 10 September 2002.

Quantum Lunch, Los Alamos National Laboratory, Los Alamos, New Mexico, 29 August 2002.

Feynman Festival, University of Maryland, College Park, Maryland, 23 August 2002.

Sixth International Conference on Quantum Communication, Measurement and Computing, Massachusetts Institute of Technology, Cambridge, Massachusetts, 24 July 2002.

International Conference on Quantum Information: Conceptual Foundations, Developments and Perspectives, Oviedo, Spain, 15 July 2002.

Physics Seminar, Griffith University, Nathan, Australia, 13 June 2002.

Center for Quantum Computer Technology Seminar, University of Queensland, Brisbane, Australia, 6 June 2002.

Symmetries and Mysteries: A Symposium on the Occasion of David Mermin's Retirement, Cornell University, Ithaca, New York, 12 May 2002.

AMO Physics Seminar, New York University, New York, New York, 17 April 2002

CNRI Quantum Information Theory Workshop, Dublin Institute of Technology, Dublin, Ireland, 22 March 2002.

American Mathematical Society Meeting, Atlanta, Georgia, 8 March 2002.

Research Seminar, Graduate School of Information Sciences, Tohoku University, Sendai, Japan, 22 February 2002.

Workshop on Information Technology Solutions for Challenges Facing the 21st Century Army, National Defense University, Washington, DC, 14 November 2001.

10th UK Conference on the Foundations of Modern Physics, Belfast, Ireland, 13 September 2001.

Information Theory and Its Applications to Biology, Finance and Physics, Warsaw, Poland, 23 May 2001.

American Mathematical Society Meeting, Hoboken, New Jersey, 28 April 2001.

Research Program on Quantum Measurement and Information, Erwin Schrödinger International Institute for Mathematical Physics, Vienna, Austria, 8 December 2000.

Mathematical Physics Seminar, Technical University of Budapest, Budapest, Hungary, 4 December 2000.

Workshop on Quantum Computation and Information, California Institute of Technology, Pasadena, California, 15 November 2000.

Annual Meeting, Optical Society of America, Rhode Island Convention Center, Providence, Rhode Island, 23 October 2000.

Physics Colloquium, University of North Carolina, Chapel Hill, North Carolina, 29 September 2000.

Quantum Information Seminar, Bell Labs, Lucent Technologies, Murray Hill, New Jersey, 16 August 2000.

Fifth International Conference on Quantum Communication Measurement & Computing (QCMC-Y2K), Capri, Italy, 5 July 2000.

NATO Advanced Research Workshop on Decoherence and its Implications in Quantum Computation and Information Transfer, Mykonos, Greece, 26 June 2000.

Department of Applied Mathematics, University of Bristol, Bristol, England, 7 June 2000.

Bell Labs, Lucent Technologies, Murray Hill, New Jersey, 31 May 2000.

952nd American Mathematical Society Meeting, University of Massachusetts Lowell, Lowell, Massachusetts, 1 April 2000.

Quantum Communication Seminar, Tamagawa University, Tokyo, Japan, 8–9 March 2000.

Physics Colloquium, Technion–Israel Institute of Technology, Haifa, Israel, 24 February 2000.

Symposium on Quantum Information Theory, Technion–Israel Institute of Technology, Haifa, Israel, 21 February 2000.

Physics Colloquium, Amherst College, Amherst, Massachusetts, 10 February 2000.

American Mathematical Society Annual Meeting, Washington, DC, 19 January 2000.

Chance in Physics: Foundations and Perspectives, Istituto Italiano Per Gli Studi Filosofici, Ischia, Naples, Italy, 29 November 1999.

Second Workshop on Fundamental Problems in Quantum Theory, Baltimore, Maryland, 9 August 1999.

Workshop on Complexity, Computation and the Physics of Information, Isaac Newton Institute, Cambridge, England, 9 July 1999.

Electrical Engineering and Computer Science Special Seminar, Massachusetts Institute of Technology, Cambridge, Massachusetts, 15 March 1999.

Microsoft Research Seminar, Redmond, Washington, 22 February 1999.

AMO Physics Seminar, University of Wisconsin at Madison, Madison, Wisconsin, 11 February 1999.

Southwest Quantum Information and Technology (SQUINT) Network Kickoff Meeting, Almaden, California, 17 December 1998.

Information Physics Seminar, University of New Mexico, Albuquerque, New Mexico, 29 October 1998.

Progress in Quantum Computing, Cryptography and Communication, Benasque Center for Physics, Benasque, Spain, July 1998.

Quantum Algorithms, International Conference and Research Center for Computer Science, Schloss Dagstuhl, Germany, 13 May 1998.

Seminar, Max Planck Institute for Quantum Optics, Garching, Germany, 7 April 1998.

Quantum Communication Seminar, Tamagawa University, Tokyo, Japan, 7 March 1998.

The 1st NASA International Conference on Quantum Computing & Quantum Communication (NASA QCQC'98), Palm Springs, California, 18 February 1998.

IBM Research Division Physics Seminar, Yorktown Heights, New York, 9 February 1998.

Electrical and Computer Engineering Seminar, University of California at Los Angeles, Los Angeles, California, 3 October 1997.

Royal Holloway College Physics Seminar, London, England, 19 September 1997.

Electronic Engineering and Computer Systems Seminar, University of Wales, Bangor, Wales, 15 September 1997.

Workshop on Quantum Computation 1997, Institute for Scientific Interchange, Turin, Italy, 30 June 1997.

First Killam Workshop on Quantum Information Theory, Université de Montréal, Montréal, Canada, 27 May 1997.

Atomic Physics Seminar, The University of Texas, Austin, Texas, 15 May 1997.

Mini-Workshop on Information Physics, Center for Advanced Studies, University of New Mexico, Albuquerque, New Mexico, 30 April 1997.

Quantum Information and Computation (QUIC) Institute Seminar, California Institute of Technology, Pasadena, California, 14 April 1997.

AT&T Seminar on Quantum Computation and Error Correction, AT&T Bell Labs, Murray Hill, New Jersey, 19 March 1997.

Information Physics Seminar, University of New Mexico, Albuquerque, New Mexico, 3 March 1997.

Physics Seminar, University of Innsbruck, Innsbruck, Austria, 23 December 1996.

Quantum Information and Computation (QUIC) Institute Workshop for DARPA and ARO, California Institute of Technology, Pasadena, California, 13 November 1996.

Research Program on Quantum Computers and Quantum Coherence, Institute for Theoretical Physics, Santa Barbara, California, October 1996.

Third International Conference on Quantum Communication and Measurement, Tamagawa University, Tokyo, Japan, 27 September 1996.

IBM Research Division Physics Seminar, Yorktown Heights, New York, 31 July 1996.

Workshop on Quantum Computation 1996, Institute for Scientific Interchange, Turin, Italy, 1 July 1996.

Physics Colloquium, Parks College of St. Louis University, St. Louis, Missouri, 17 May 1996.

Workshop on Quantum Computation 1995, Institute for Scientific Interchange, Turin, Italy, 3 July 1995.

Los Alamos National Laboratory "Quantum Lunch," Los Alamos, New Mexico, 27 January 1995.

Workshop on Quantum Computation, Institute for Scientific Interchange, Turin, Italy, 31 October 1994.

Clarendon Laboratory Theoretical Physics Seminar, Oxford University, Oxford, England, 21 July 1994.

Imperial College of Science, Technology and Medicine Theoretical Physics Seminar, London, England, 20 July 1994.

University of Plymouth Mathematics Seminar, Plymouth, England, 18 July 1994.

Third Santa Fe Workshop on Complexity, Entropy, and Physics of Information, Santa Fe, New Mexico, 19 May 1994.