

References

- Abramsky, S. 2010. No-cloning in categorical quantum mechanics. Pages 1–28 of: Gay, S., and Mackie, I. (eds), *Semantic Techniques in Quantum Computation*. Cambridge University Press. Arxiv preprint arXiv:0910.2401.
- Abramsky, S., and Coecke, B. 2004. A categorical semantics of quantum protocols. Pages 415–425 of: *Proceedings of the 19th Annual IEEE Symposium on Logic in Computer Science (LICS)*. arXiv:quant-ph/0402130.
- Abramsky, S., and Coecke, B. 2005. Abstract physical traces. *Theory and Applications of Categories*, **14**(6), 111–124. arXiv:0910.3144.
- Abramsky, S., and Heunen, C. 2012. Operational theories and categorical quantum mechanics. In: *Logic and Algebraic Structures in Quantum Computing*. Cambridge University Press. arXiv:1206.0921.
- Abramsky, S., and Jagadeesan, R. 1994. New foundations for the geometry of interaction. *Information and Computation*, **111**, 53–119.
- Abramsky, S., and Tzevelekos, N. 2011. Introduction to categories and categorical logic. Pages 3–94 of: Coecke, B. (ed), *New Structures for Physics*. Lecture Notes in Physics. Springer-Verlag.
- Alberti, P. M., and Uhlmann, A. 1982. *Stochasticity and Partial Order*. Mathematics and Its Applications, vol. 9. Reidel.
- Ambainis, A. 2010. *New developments in quantum algorithms*. arXiv:1006.4014.
- Aspect, A., Grangier, P., and Roger, G. 1981. Experimental tests of realistic local theories via Bell’s theorem. *Physical Review Letters*, **47**(7), 460.
- Aspect, A., Dalibard, J., and Roger, G. 1982. Experimental test of Bell’s inequalities using time-varying analyzers. *Physical Review Letters*, **49**(25), 1804.
- Awodey, S. 2010. *Category Theory*. Oxford University Press.
- Backens, M. 2014a. The ZX-calculus is complete for the single-qubit Clifford+T group. Pages 293–303 of: Coecke, B., Hasuo, I. and Panangaden, P. (eds), *Proceedings of the 11th Workshop on Quantum Physics and Logic*. Electronic Proceedings in Theoretical Computer Science, vol. 172. Open Publishing Association.
- Backens, M. 2014b. *The ZX-calculus is complete for the single-qubit Clifford+T group*. arXiv:1412.8553.
- Backens, M., and Nabi Duman, A. 2015. A complete graphical calculus for Spekkens’ toy bit theory. *Foundations of Physics*. arXiv:1411.1618.
- Backens, M., Perdrix, S., and Wang, Q. 2016. A simplified stabilizer ZX-calculus. In: *Proceedings of the 13th International Conference on Quantum Physics and Logic*. arXiv:1602.04744.

- Baez, J. C. 1993–2010. *This week's finds in mathematical physics*. math.ucr.edu/home/baez/TWF.html.
- Baez, J. C. 2006. Quantum quandaries: a category-theoretic perspective. Pages 240–266 of: Rickles, D., French, S., and Saatsi, J.T. (eds), *The Structural Foundations of Quantum Gravity*. Oxford University Press. arXiv:quant-ph/0404040.
- Baez, J. C., and Dolan, J. 1995. Higher-dimensional algebra and topological quantum field theory. *Journal of Mathematical Physics*, **36**, 6073. arXiv:q-alg/9503002.
- Baez, J. C., and Erbele, J. *Categories in control*. arXiv:1405.6881.
- Baez, J. C., and Fong, B. 2015. A compositional framework for passive linear networks. arXiv:1504.05625.
- Baez, J. C., and Lauda, A. 2011. A prehistory of n-categorical physics. Pages 13–128 of: Halvorson, H. (ed), *Deep Beauty: Understanding the Quantum World through Mathematical Innovation*. Cambridge University Press.
- Baez, J. C., and Stay, M. 2011. Physics, topology, logic and computation: a Rosetta Stone. Pages 95–172 of: Coecke, B. (ed), *New Structures for Physics*. Lecture Notes in Physics. Springer.
- Balkir, E., Sadrzadeh, M., and Coecke, B. 2016. *Distributional Sentence Entailment Using Density Matrices*. Cham: Springer International Publishing. Pages 1–22.
- Ballance, C. J., Harty, T. P., Linke, N. M., Sepiol, M. A., and Lucas, D. M. 2016. High-Fidelity Quantum Logic Gates Using Trapped-Ion Hyperfine Qubits. *Physical Review Letters*, **117**(6), 060504.
- Baltag, A., and Smets, S. 2005. Complete axiomatizations for quantum actions. *International Journal of Theoretical Physics*, **44**, 2267–2282.
- Bankova, D., Coecke, B., Lewis, M., and Marsden, D. 2016. Graded entailment for compositional distributional semantics. In: *Proceedings of the 13th International Conference on Quantum Physics and Logic*. arXiv:1601.04908.
- Barenco, A., Bennett, C. H., Cleve, R., DiVincenzo, D. P., Margolus, N., Shor, P. W., Sleator, T., Smolin, J. A., and Weinfurter, H. 1995. Elementary gates for quantum computation. *Physical Review A*, **52**, 3457–3467.
- Barnum, H., Caves, C. M., Fuchs, C. A., Jozsa, R., and Schumacher, B. 1996. Noncommuting mixed states cannot be broadcast. *Physical Review Letters*, **76**, 2818.
- Barnum, H., Barrett, J., Leifer, M., and Wilce, A. 2007. A generalized no-broadcasting theorem. *Physical Review Letters*, **99**(24), 240501.
- Barr, M., and Wells, C. 1990. *Category Theory for Computing Science*. New York: Prentice Hall.
- Barrett, J. 2007. Information processing in generalized probabilistic theories. *Physical Review A*, **75**, 032304.
- Belinfante, F. J. 1973. *Survey of Hidden-Variables Theories*. Pergamon Press.
- Bell, J. S. 1964. On the Einstein–Podolsky–Rosen paradox. *Physics*, **1**(3), 195–200.
- Benabou, J. 1963. Categories avec multiplication. *Comptes Rendus des Séances de l'Académie des Sciences. Paris*, **256**, 1887–1890.
- Benioff, P. 1980. The computer as a physical system: a microscopic quantum mechanical Hamiltonian model of computers as represented by Turing machines. *Journal of Statistical Physics*, **22**, 563–591.
- Bennett, C. H., and Brassard, G. 1984. Quantum cryptography: public key distribution and coin tossing. Pages 175–179 of: *Proceedings of IEEE International Conference on Computers, Systems and Signal Processing*. IEEE.
- Bennett, C. H., and Wiesner, S. 1992. Communication via one- and two-particle operators on Einstein–Podolsky–Rosen states. *Physical Review Letters*, **69**, 2881–2884.

- Bennett, C. H., Brassard, G., Crepeau, C., Jozsa, R., Peres, A., and Wootters, W. K. 1993. Teleporting an unknown quantum state via dual classical and Einstein–Podolsky–Rosen channels. *Physical Review Letters*, **70**(13), 1895–1899.
- Birkhoff, G., and von Neumann, J. 1936. The logic of quantum mechanics. *Annals of Mathematics*, **37**, 823–843.
- Bloch, F. 1946. Nuclear induction. *Physical Review*, **70**, 460–474.
- Blute, R. F., Ivanov, I. T., and Panangaden, P. 2003. Discrete quantum causal dynamics. *International Journal of Theoretical Physics*, **42**(9), 2025–2041.
- Bohm, D. 1952a. A suggested interpretation of the quantum theory in terms of hidden” variables. I. *Physical Review*, **85**(2), 166.
- Bohm, D. 1952b. A suggested interpretation of the quantum theory in terms of ‘hidden’ variables. II. *Physical Review*, **85**(2), 180.
- Bohm, D. 1986. Time, the implicate order and pre-space. Pages 172–208 of: Griffin, D. R. (ed), *Physics and the Ultimate Significance of Time*. SUNY Press.
- Bohm, D., and Peat, F. D. 1987. *Science, Order, and Creativity*. Routledge.
- Bohr, N. 1931. *Atomtheorie und Naturbeschreibung*. Springer.
- Bohr, N. 1935. Quantum mechanics and physical reality. *Nature*, **136**, 65.
- Bohr, N. 1961. *Atomic Physics and Human Knowledge*. Science Editions.
- Boixo, S., and Heunen, C. 2012. Entangled and sequential quantum protocols with dephasing. *Physical Review Letters*, **108**, 120402. arXiv:1108.3569.
- Bonchi, F., Sobocinski, P., and Zanasi, F. 2014a. A categorical semantics of signal flow graphs. Pages 435–450 of: *CONCUR’14: Concurrency Theory*. Lecture Notes in Computer Science, vol. 8704. Springer.
- Bonchi, F., Sobocinski, P., and Zanasi, F. 2014b. Interacting bialgebras are Frobenius. Pages 351–365 of: *17th International Conference on Foundations of Software Science and Computation Structures (FOSSACS)*.
- Borceux, F. 1994a. *Handbook of Categorical Algebra: Basic Category Theory*. Cambridge University Press.
- Borceux, F. 1994b. *Handbook of Categorical Algebra: Categories and Structures*. Cambridge University Press.
- Born, M. 1926. Quantenmechanik der stoßvorgänge. *Zeitschrift für Physik*, **38**(11–12), 803–827.
- Born, M., and Jordan, P. 1925. Zur Quantenmechanik. *Zeitschrift für Physik*, **34**, 858–888.
- Bourbaki, N. 1959–2004. *Éléments de mathématique*. CCLS & Editions Masson.
- Bourbaki, N. 1981. *Espaces vectoriels topologiques*. Springer.
- Bourbaki, N. 1987. *Topological Vector Spaces*. Springer.
- Bouwmeester, D., Pan, J.-W., Mattle, K., Eibl, M., Weinfurter, H., and Zeilinger, A. 1997. Experimental quantum teleportation. *Nature*, **390**(6660), 575–579.
- Brandão, F. G. S. L., Horodecki, M., Oppenheim, J., Renes, J. M., and Spekkens, R. W. 2013. The resource theory of quantum states out of thermal equilibrium. *Physical Review Letters*, **111**, 250404.
- Brauer, R., and Nesbitt, C. 1937. On the regular representations of algebras. *Proceedings of the National Academy of Sciences of the United States of America*, **23**(4), 236.
- Bub, J. 1999. *Interpreting the Quantum World*. Cambridge University Press.
- Buchsbaum, D. 1955. Exact categories and duality. *Transactions of the American Mathematical Society*, **80**, 1–34.
- Bundy, A., Cavallo, F., Dixon, L., Johansson, M., and McCasland, R. N.d. 2015. The theory behind TheoryMine. *IEEE Intelligent Systems*, **30**(4), 64–69.

- Carboni, A., and Walters, R. F. C. 1987. Cartesian bicategories I. *Journal of Pure and Applied Algebra*, **49**, 11–32.
- Carroll, L. 1942. *Alice in Wonderland*. Pelangi Publishing Group Bhd.
- Chiribella, G. 2014. *Distinguishability and copiability of programs in general process theories*. arXiv:1411.3035.
- Chiribella, G., and Scandolo, C. M. 2015. Entanglement and thermodynamics in general probabilistic theories. *New Journal of Physics*, **17**, 103027.
- Chiribella, G., D'Ariano, G. M., and Perinotti, P. 2010. Probabilistic theories with purification. *Physical Review A*, **81**(6), 062348.
- Chiribella, G., D'Ariano, G. M., and Perinotti, P. 2011. Informational derivation of quantum theory. *Physical Review A*, **84**(1), 012311.
- Choi, M.-D. 1975. Completely positive linear maps on complex matrices. *Linear Algebra and Its Applications*, **10**, 285–290.
- Clark, S., Coecke, B., Grefenstette, E., Pulman, S., and Sadrzadeh, M. 2014. A quantum teleportation inspired algorithm produces sentence meaning from word meaning and grammatical structure. *Malaysian Journal of Mathematical Sciences*, **8**, 15–25. arXiv:1305.0556.
- Clifton, R., Bub, J., and Halvorson, H. 2003. Characterizing quantum theory in terms of information-theoretic constraints. *Foundations of Physics*, **33**, 1561–1591.
- Coecke, B. 2000. Structural characterization of compoundness. *International Journal of Theoretical Physics*, **39**, 585–594.
- Coecke, B. 2003. *The logic of entanglement. An invitation*. Tech. rept. RR-03-12. Department of Computer Science, Oxford University.
- Coecke, B. 2005. Kindergarten quantum mechanics. Pages 81–98 of: Khrennikov, A. (ed), *Quantum Theory: Reconsiderations of the Foundations III*. AIP Press. arXiv:quant-ph/0510032.
- Coecke, B. 2007. De-linearizing linearity: projective quantum axiomatics from strong compact closure. *Electronic Notes in Theoretical Computer Science*, **170**, 49–72. arXiv:quant-ph/0506134.
- Coecke, B. 2008. Axiomatic description of mixed states from Selinger's CPM-construction. *Electronic Notes in Theoretical Computer Science*, **210**, 3–13.
- Coecke, B. 2009. Quantum pictorialism. *Contemporary Physics*, **51**, 59–83. arXiv:0908.1787.
- Coecke, B. 2011. A universe of processes and some of its guises. Pages 129–186 of: Halvorson, H. (ed), *Deep Beauty: Understanding the Quantum World through Mathematical Innovation*. Cambridge University Press. arXiv:1009.3786.
- Coecke, B. 2013. An alternative Gospel of structure: order, composition, processes. Pages 1–22 of: Heunen, C., Sadrzadeh, M., and Grefenstette, E. (eds), *Quantum Physics and Linguistics: A Compositional, Diagrammatic Discourse*. Oxford University Press. arXiv:1307.4038.
- Coecke, B. 2014a. *The Logic of Entanglement*. Cham: Springer International Publishing. Pages 250–267.
- Coecke, B. 2014b. *Terminality implies non-signalling*. arXiv:1405.3681.
- Coecke, B. 2016. The logic of quantum mechanics – take II. Pages 174–198 of: Chubb, J., Eskandarian, A., and Harizanov, V. (eds), *Logic and Algebraic Structures in Quantum Computing*. Cambridge University Press. arXiv:1204.3458.
- Coecke, B., and Duncan, R. 2008. Interacting quantum observables. In: *Proceedings of the 37th International Colloquium on Automata, Languages and Programming (ICALP)*. Lecture Notes in Computer Science.

- Coecke, B., and Duncan, R. 2011. Interacting quantum observables: categorical algebra and diagrammatics. *New Journal of Physics*, **13**, 043016. arXiv:quant-ph/09064725.
- Coecke, B., and Edwards, B. 2010. Three qubit entanglement within graphical Z/X-calculus. *Electronic Proceedings in Theoretical Computer Science*, **52**, 22–33.
- Coecke, B., and Edwards, B. 2011. Toy quantum categories. *Electronic Notes in Theoretical Computer Science*, **270**(1), 29–40. arXiv:0808.1037.
- Coecke, B., and Edwards, B. 2012. Spekkens's toy theory as a category of processes. In: Abramsky, S., and Mislove, M. (eds), *Mathematical Foundations of Information Flow*. Proceedings of symposia in applied mathematics. American Mathematical Society. arXiv:1108.1978.
- Coecke, B., and Heunen, C. 2011. Pictures of complete positivity in arbitrary dimension. *Quantum Physics and Logic, Electronic Proceedings in Theoretical Computer Science*, **95**, 27–35. arXiv:1210.0298.
- Coecke, B., and Kissinger, A. 2010. The compositional structure of multipartite quantum entanglement. Pages 297–308 of: *Automata, Languages and Programming*. Lecture Notes in Computer Science. Springer. arXiv:1002.2540.
- Coecke, B., and Lal, R. 2013. Causal categories: relativistically interacting processes. *Foundations of Physics*, **43**, 458–501. arXiv:1107.6019.
- Coecke, B., and Paquette, É. O. 2008. POVMs and Naimark's theorem without sums. *Electronic Notes in Theoretical Computer Science*, **210**, 15–31. arXiv:quant-ph/0608072.
- Coecke, B., and Paquette, É. O. 2011. Categories for the practicing physicist. Pages 167–271 of: Coecke, B. (ed), *New Structures for Physics*. Lecture Notes in Physics. Springer. arXiv:0905.3010.
- Coecke, B., and Pavlovic, D. 2007. Quantum measurements without sums. Pages 567–604 of: Chen, G., Kauffman, L., and Lomonaco, S. (eds), *Mathematics of Quantum Computing and Technology*. Taylor and Francis. arXiv:quant-ph/0608035.
- Coecke, B., and Perdrix, S. 2010. Environment and classical channels in categorical quantum mechanics. Pages 230–244 of: *Proceedings of the 19th EACSL Annual Conference on Computer Science Logic (CSL)*. Lecture Notes in Computer Science, vol. 6247. Extended version: arXiv:1004.1598.
- Coecke, B., and Smets, S. 2004. The Sasaki hook is not a [static] implicative connective but induces a backward [in time] dynamic one that assigns causes. *International Journal of Theoretical Physics*, **43**, 1705–1736.
- Coecke, B., and Spekkens, R. W. 2012. Picturing classical and quantum Bayesian inference. *Synthese*, **186**, 651–696. arXiv:1102.2368.
- Coecke, B., Moore, D. J., and Wilce, A. 2000. Operational quantum logic: an overview. Pages 1–36 of: Coecke, B., Moore, D. J., and Wilce, A. (eds), *Current Research in Operational Quantum Logic: Algebras, Categories and Languages*. Fundamental Theories of Physics, vol. 111. Springer-Verlag. arXiv:quant-ph/0008019.
- Coecke, B., Moore, D. J., and Stubbe, I. 2001. Quantaloids describing causation and propagation of physical properties. *Foundations of Physics Letters*, **14**, 133–146. arXiv:quant-ph/0009100.
- Coecke, B., Paquette, É. O., and Perdrix, S. 2008a. Bases in diagrammatic quantum protocols. *Electronic Notes in Theoretical Computer Science*, **218**, 131–152. arXiv:0808.1029.
- Coecke, B., Paquette, É. O., and Pavlović, D. 2008b. *Classical and quantum structures*. Tech. rept. RR-08-02. Department of Computer Science, Oxford University.

- Coecke, B., Paquette, É. O., and Pavlović, D. 2010a. Classical and quantum structuralism. Pages 29–69 of: Gay, S., and Mackie, I. (eds), *Semantic Techniques in Quantum Computation*. Cambridge University Press. arXiv:0904.1997.
- Coecke, B., Kissinger, A., Merry, A., and Roy, S. 2010b. The GHZ/W-calculus contains rational arithmetic. *Electronic Proceedings in Theoretical Computer Science*, **52**, 34–48.
- Coecke, B., Sadrzadeh, M., and Clark, S. 2010c. Mathematical foundations for a compositional distributional model of meaning. Pages 345–384 of: van Benthem, J., Moortgat, M., and Buszkowski, W. (eds), *A Festschrift for Jim Lambek*. Linguistic Analysis, vol. 36. arxiv:1003.4394.
- Coecke, B., Wang, Q., Wang, B., Wang, Y., and Zhang, Q. 2011a. Graphical calculus for quantum key distribution (extended abstract). *Electronic Notes in Theoretical Computer Science*, **270**(2), 231–249.
- Coecke, B., Edwards, B., and Spekkens, R. W. 2011b. Phase groups and the origin of non-locality for qubits. *Electronic Notes in Theoretical Computer Science*, **270**(2), 15–36. arXiv:1003.5005.
- Coecke, B., Duncan, R., Kissinger, A., and Wang, Q. 2012. Strong complementarity and non-locality in categorical quantum mechanics. In: *Proceedings of the 27th Annual IEEE Symposium on Logic in Computer Science (LICS)*. arXiv:1203.4988.
- Coecke, B., Heunen, C., and Kissinger, A. 2013a. *Categories of quantum and classical channels*. arXiv:1305.3821.
- Coecke, B., Heunen, C., and Kissinger, A. 2013b. Compositional quantum logic. Pages 21–36 of: *Computation, Logic, Games, and Quantum Foundations: The Many Facets of Samson Abramsky*. Springer.
- Coecke, B., Pavlović, D., and Vicary, J. 2013c. A new description of orthogonal bases. *Mathematical Structures in Computer Science*, **23**, 555–567. arXiv:quant-ph/0810.1037.
- Coecke, B., Fritz, T., and Spekkens, R. W. 2016. A mathematical theory of resources. *Information and Computation*.
- Coecke, B., Duncan, R., Kissinger, A., and Wang, Q. 2016. Generalised compositional theories and diagrammatic reasoning. In: Chiribella, G., and Spekkens, R. W. (eds), *Quantum Theory: Informational Foundations and Foils*. Fundamental Theories of Physics. Springer. arXiv:1203.4988.
- Coqand, T., Heut, G., et al. 1984. *Coq theorem prover*. <https://coq.inria.fr/>.
- Cunningham, O., and Heunen, C. 2015. Axiomatizing complete positivity. Pages 148–157 of: Heunen, C., Selinger, P., and Vicary, J. (eds), *Proceedings of the 12th International Workshop on Quantum Physics and Logic*. Electronic Proceedings in Theoretical Computer Science, vol. 195. Open Publishing Association.
- Davies, E. B. 1976. *Quantum Theory of Open Systems*. Academic Press.
- Davies, E. B., and Lewis, J. T. 1970. An operational approach to quantum probability. *Communications in Mathematical Physics*, **17**, 239–260.
- Deutsch, D. 1985. Quantum theory, the Church–Turing principle and the universal quantum computer. *Proceedings of the Royal Society of London. A. Mathematical and Physical Sciences*, **400**(1818), 97–117.
- Deutsch, D. 1989. Quantum computational networks. *Proceedings of the Royal Society of London*, **425**.
- Deutsch, D. 1991. Quantum mechanics near closed timelike lines. *Physical Review D*, **44**, 3197.

- Deutsch, D., and Jozsa, R. 1992. Rapid solution of problems by quantum computation. *Proceedings of the Royal Society of London. Series A: Mathematical and Physical Sciences*, **439**(1907), 553–558.
- Dieks, D. G. B. J. 1982. Communication by EPR devices. *Physics Letters A*, **92**(6), 271–272.
- Dijkstra, E. W. 1968. A constructive approach to the problem of program correctness. *BIT Numerical Mathematics*, **8**, 174–186.
- Dirac, P. A. M. 1926. On the theory of quantum mechanics. *Proceedings of the Royal Society A*, **112**, 661–677.
- Dirac, P. A. M. 1939. A new notation for quantum mechanics. Pages 416–418 of: *Proceedings of the Cambridge Philosophical Society*, vol. 35. Cambridge University Press.
- Dixon, L., and Duncan, R. 2009. Graphical reasoning in compact closed categories for quantum computation. *Annals of Mathematics and Artificial Intelligence*, **56**(1), 23–42.
- Dixon, L., and Duncan, R. 2010. Extending graphical representations for compact closed categories with applications to symbolic quantum computation. *Intelligent Computer Mathematics*, 77–92.
- Dixon, L., and Kissinger, A. 2013. Open-graphs and monoidal theories. *Mathematical Structures in Computer Science*, **23**(2), 308–359.
- Dixon, L., Duncan, R., and Kissinger, A. 2010. Open graphs and computational reasoning. Pages 169–180 of: Cooper, S. B., Panangaden, P. and Kashefi, E. (eds), *Proceedings of the Sixth Workshop on Developments in Computational Models: Causality, Computation, and Physics*. Electronic Proceedings in Theoretical Computer Science, vol. 26. Open Publishing Association.
- Dixon, L., Duncan, R., Merry, A., Kissinger, A., Soloviev, M., and Zamzhiev, V. 2011. quantomatic. <http://quantomatic.github.io>.
- Duncan, R. 2006. *Types for quantum computation*. DPhil Thesis, Oxford University.
- Duncan, R. 2012. *A graphical approach to measurement-based quantum computing*. arXiv:1203.6242.
- Duncan, R., and Lucas, M. 2013. Verifying the Steane code with Quantomatic. In: *Proceedings of the 10th International Workshop on Quantum Physics and Logic*. arXiv:1306.4532.
- Duncan, R., and Perdrix, S. 2009. Graph states and the necessity of Euler decomposition. *Mathematical Theory and Computational Practice*, 167–177.
- Duncan, R., and Perdrix, S. 2010. Rewriting measurement-based quantum computations with generalised flow. Pages 285–296 of: *Proceedings of ICALP*. Lecture Notes in Computer Science. Springer.
- Duncan, R., and Perdrix, S. 2013. Pivoting makes the ZX-calculus complete for real stabilizers. In: *Proceedings of the 10th International Workshop on Quantum Physics and Logic*. arXiv:1307.7048.
- Dür, W., Vidal, G., and Cirac, J. I. 2000. Three qubits can be entangled in two inequivalent ways. *Physical Review A*, **62**(062314).
- Durt, T., Englert, B.-G., Bengtsson, I., and Życzkowski, K. 2010. On mutually unbiased bases. *International Journal of Quantum Information*, **8**, 535–640.
- Eckmann, B., and Hilton, P. J. 1962. Group-like structures in general categories. I. Multiplications and comultiplications. *Mathematische Annalen*, **145**(3).
- Edwards, B. 2009. *Non-locality in categorical quantum mechanics*. PhD thesis, University of Oxford.

- Eilenberg, S., and Mac Lane, S. 1945. General theory of natural equivalences. *Transactions of the American Mathematical Society*, **58**(2), 231.
- Einstein, A. 1936. Physics and reality. *Journal of the Franklin Institute*, **221**(3), 349–382.
- Einstein, A., Podolsky, B., and Rosen, N. 1935. Can quantum-mechanical description of physical reality be considered complete? *Physical Review*, **47**(10), 777.
- Ekert, A. K. 1991. Quantum cryptography based on Bell's theorem. *Physical Review Letters*, **67**(6), 661–663.
- Evans, J., Duncan, R., Lang, A., and Panangaden, P. 2009. *Classifying all mutually unbiased bases in Rel.* arXiv:0909.4453.
- Everett, H. III. 1957. "Relative state" formulation of quantum mechanics. *Reviews of Modern Physics*, **29**(3), 454.
- Faure, C.-A., Moore, D. J., and Piron, C. 1995. Deterministic evolutions and Schrödinger flows. *Helvetica Physica Acta*, **68**(2), 150–157.
- Fausser, B. 2013. Some graphical aspects of Frobenius structures. Pages 23–48 of: Heunen, C., Sadrzadeh, M., and Grefenstette, E. (eds), *Quantum Physics and Linguistics: A Compositional, Diagrammatic Discourse*. Oxford University Press. arXiv:1202.6380.
- Feynman, R. P. 1982. Simulating physics with computers. *International Journal of Theoretical Physics*, **21**, 467–488.
- Fong, B., and Nava-Kopp, H. 2015. Additive monotones for resource theories of parallel-combinable processes with discarding. *Electronic Proceedings in Theoretical Computer Science*, **195**, 170–178. arXiv:1505.02651.
- Fort, C. 1931. *Lo!* Cosimo Books.
- Foulis, D. J., and Randall, C. H. 1972. Operational statistics. I. Basic concepts. *Journal of Mathematical Physics*, **13**(11), 1667–1675.
- Freyd, P. 1964. *Abelian Categories*. New York: Harper and Row.
- Freyd, P., and Yetter, D. 1989. Braided compact closed categories with applications to low-dimensional topology. *Advances in Mathematics*, **77**, 156–182.
- Fritz, T. 2014. *Beyond Bell's theorem II: scenarios with arbitrary causal structure*. arXiv:1404.4812.
- Fritz, T. 2015. Resource convertibility and ordered commutative monoids. *Mathematical Structures in Computer Science*, **10**, 1–89.
- Fuchs, C. A. 2002. *Quantum mechanics as quantum information (and only a little more)*. arXiv: quant-ph/0205039.
- Fuchs, C. A., Mermin, N. D., and Schack, R. 2014. An introduction to QBism with an application to the locality of quantum mechanics. *American Journal of Physics*, **82**, 749–754. arXiv:1311.5253.
- Ghirardi, G.-C., Rimini, A., and Weber, T. 1980. A general argument against superluminal transmission through the quantum mechanical measurement process. *Lettere Al Nuovo Cimento*, **27**(10), 293–298.
- Gilbreth, F. B., and Gilbreth, L. M. 1922. Process charts and their place in management. *Mechanical engineering*, **70**, 38–41.
- Girard, J.-Y. 1989. Towards a geometry of interaction. *Contemporary Mathematics*, **92**, 69–108.
- Gleason, A. M. 1957. Measures on the closed subspaces of a Hilbert space. *Journal of Mathematics and Mechanics*, **6**, 885–893.
- Gogioso, S. 2015a. *A bestiary of sets and relations*. arXiv:1506.05025.
- Gogioso, S. 2015b. *Categorical semantics for Schrödinger's equation*. arXiv:1501.06489.
- Gogioso, S. 2015c. *Monadic dynamics*. arXiv:1501.04921.

- Gogioso, S., and Genovese, F. 2016. Infinite-dimensional categorical quantum mechanics. In: *Proceedings of QPL*. arXiv:1605.04305.
- Gogioso, S., and Kissinger, A. 2016. *Fully graphical treatment of the Hidden Subgroup Problem*. Unpublished.
- Gogioso, S., and Zeng, W. 2015. *Mermin non-locality in abstract process theories*. arXiv:1506.02675.
- Gonthier, G. 2008. *The Four Colour Theorem: Engineering of a Formal Proof*. Berlin and Heidelberg: Springer. Page 333.
- Gonthier, G., Asperti, A., Avigad, J., Bertot, Y., Cohen, C., Garillot, F., Le Roux, S., Mahboubi, A., O'Connor, R., Biha, S. O., et al. 2013. A machine-checked proof of the odd order theorem. Pages 163–179 of: *Interactive Theorem Proving*. Springer.
- Gordon, M. 2000. From LCF to HOL: a short history. Pages 169–186 of: *Proof, Language, and Interaction*.
- Gordon, M. J., Milner, A. J., and Wadsworth, C. P. 1979. *Lecture Notes in Computer Science*. Vol. 78. Berlin: Springer-Verlag.
- Gottesman, D., and Chuang, I. L. 1999. Demonstrating the viability of universal quantum computation using teleportation and single-qubit operations. *Nature*, **402**(6760), 390–393.
- Gour, G., and Spekkens, R. W. 2008. The resource theory of quantum reference frames: manipulations and monotones. *New Journal of Physics*, **10**, 033023.
- Gour, G., Müller, M. P., Narasimhachar, V., Spekkens, R. W., and Yunger Halpern, N. 2013. *The resource theory of informational nonequilibrium in thermodynamics*. arXiv:1309.6586.
- Greenberger, D. M., Horne, M. A., Shimony, A., and Zeilinger, A. 1990. Bell's theorem without inequalities. *American Journal of Physics*, **58**, 1131–1143.
- Grefenstette, E., and Sadrzadeh, M. 2011. Experimental support for a categorical compositional distributional model of meaning. Pages 1394–1404 of: *The 2014 Conference on Empirical Methods on Natural Language Processing*. arXiv:1106.4058.
- Gröblacher, S., Paterek, T., Kaltenbaek, R. R., Brukner, Č., Żukowski, M., Aspelmeyer, M., and Zeilinger, A. 2007. An experimental test of non-local realism. *Nature*, **446**, 871–875.
- Grothendieck, A. 1957. Sur quelques points d'algèbre homologique. *Tohoku Math J.*, 119–221.
- Grover, L. K. 1996. A fast quantum mechanical algorithm for database search. Pages 212–219 of: *Proceedings of the Twenty-eighth Annual ACM Symposium on Theory of Computing*. STOC '96. New York: ACM.
- Hadzihasanovic, A. 2015. A diagrammatic axiomatisation for qubit entanglement. In: *Proceedings of the 30th Annual IEEE Symposium on Logic in Computer Science (LICS)*. arXiv:1501.07082.
- Hales, T., Adams, M., Bauer, G., Dang, D. T., Harrison, J., Hoang, T. L., Kaliszyk, C., Magron, V., McLaughlin, S., Nguyen, T. T., et al. 2015. A formal proof of the Kepler conjecture. *arXiv preprint arXiv:1501.02155*.
- Harding, J. 2009. A link between quantum logic and categorical quantum mechanics. *International Journal of Theoretical Physics*, **48**(3), 769–802.
- Hardy, L. N.d. *Disentangling nonlocality and teleportation*. arXiv:quant-ph/9906123.
- Hardy, L. 2001. Quantum theory from five reasonable axioms. *arXiv:quant-ph/0101012*.
- Hardy, L. 2011. Foliabale operational structures for general probabilistic theories. Pages 409–442 of: Halvorson, H. (ed), *Deep Beauty: Understanding the Quantum World through Mathematical Innovation*. Cambridge University Press. arXiv:0912.4740.

- Hardy, L. 2012. *The operator tensor formulation of quantum theory*. arXiv:1201.4390.
- Hardy, L. 2013a. A formalism-local framework for general probabilistic theories, including quantum theory. *Mathematical Structures in Computer Science*, **23**(2), 339–440.
- Hardy, L. 2013b. On the theory of composition in physics. Pages 83–106 of: *Computation, Logic, Games, and Quantum Foundations: The Many Facets of Samson Abramsky*. Springer. arXiv:1303.1537.
- Hardy, L., and Spekkens, R. W. 2010. Why physics needs quantum foundations. *Physics in Canada*, **66**, 73–76.
- Harrigan, N., and Spekkens, R. W. 2010. Einstein, incompleteness, and the epistemic view of quantum states. *Foundations of Physics*, **40**, 125–157.
- Hasegawa, M., Hofmann, M., and Plotkin, G. D. 2008. Finite dimensional vector spaces are complete for traced symmetric monoidal categories. Pages 367–385 of: Avron, A., Dershowitz, N., and Rabinovich, A. (eds), *Pillars of Computer Science*. Lecture Notes in Computer Science, vol. 4800. Springer.
- Hedges, J., Shpits, E., Winschel, V., and Zahn, P. 2016. *Compositionality and string diagrams for game theory*. arXiv:1604.06061.
- Hein, M., Eisert, J., and Briegel, H. J. 2004. Multiparty entanglement in graph states. *Physical Review A*, **69**, 062311.
- Heisenberg, W. 1925. Über quantentheoretische Umdeutung kinematischer und mechanischer Beziehungen. *Heisenberg (1925)*, **33**, 879–893.
- Heisenberg, W. 1930. *Die physikalischen Prinzipien der Quantentheorie*. Leipzig: S. Hirzel.
- Hensen, B., Bernien, H., Dreau, A. E., Reiserer, A., Kalb, N., Blok, M. S., Ruitenberg, J., Vermeulen, R. F. L., Schouten, R. N., Abellan, C., Amaya, W., Pruneri, V., Mitchell, M. W., Markham, M., Twitchen, D. J., Elkouss, D., Wehner, S., Taminiau, T. H., and Hanson, R. 2015. Loophole-free Bell inequality violation using electron spins separated by 1.3 kilometres. *Nature*, **526**(10), 682–686.
- Henson, J., Lal, R., and Pusey, M. F. 2014. *Theory-independent limits on correlations from generalised Bayesian networks*. arXiv:1405.2572.
- Herrmann, M. 2010. *Models of multipartite entanglement*. MSc Thesis, Oxford University.
- Heunen, C., and Jacobs, B. 2010. Quantum logic in dagger kernel categories. *Order*, **27**(2), 177–212.
- Heunen, C., and Kissinger, A. 2016. *Can quantum theory be characterized in information-theoretic terms?* arXiv:1604.05948.
- Heunen, C., Contreras, I., and Cattaneo, A. o S. 2012b. Relative Frobenius algebras are groupoids. *Journal of Pure and Applied Algebra*, **217**, 114–124.
- Heunen, C., Sadzadeh, M., and Grefenstette, E. (eds). 2012a. *Quantum Physics and Linguistics: A Compositional, Diagrammatic Discourse*. Oxford University Press.
- Hinze, R., and Marsden, D. 2016. Equational reasoning with lollipops, forks, cups, caps, snakes, and speedometers. *Journal of Logical and Algebraic Methods in Programming*.
- Hoare, C. A. R., and He, J. 1987. The weakest prespecification. *Information Processing Letters*, **24**, 127–132.
- Honda, K. 2012. Graphical classification of entangled qutrits. *Electronic Proceedings in Theoretical Computer Science*, **95**, 123–141.
- Horodecki, M., Oppenheim, J., and Horodecki, R. 2002. Are the laws of entanglement theory thermodynamical? *Physical Review Letters*, **89**, 240403.

- Horodecki, M., Horodecki, P., and Oppenheim, J. 2003. Reversible transformations from pure to mixed states and the unique measure of information. *Physical Review A*, **67**, 062104.
- Horodecki, R., Horodecki, P., Horodecki, M., and Horodecki, K. 2009. Quantum entanglement. *Reviews of Modern Physics*, **81**, 865–942. arXiv:quant-ph/0702225.
- Horsman, C. 2011. Quantum picturalism for topological cluster-state computing. *New Journal of Physics*, **13**, 095011. arXiv:1101.4722.
- Jacobs, B. 2010. Orthomodular lattices, Foulis semigroups and Dagger kernel categories. *Logical Methods in Computer Science*, **6**(2), 1.
- Jamiołkowski, A. 1972. Linear transformations which preserve trace and positive semidefiniteness of operators. *Reports on Mathematical Physics*, **3**, 275–278.
- Jammer, M. 1974. *The Philosophy of Quantum Mechanics*. John Wiley & Sons.
- Jauch, J. M. 1968. *Mathematical Foundations of Quantum Mechanics*. Addison-Wesley.
- Jauch, J. M., and Piron, C. 1963. Can hidden variables be excluded in quantum mechanics? *Helvetica Physics Acta*, **36**, 827–837.
- Johansson, M., Dixon, L., and Bundy, A. 2011. Conjecture synthesis for inductive theories. *Journal of Automated Reasoning*, **47**, 251–289.
- Jones, J. A., Mosca, M., and Hansen, R. H. 1998. Implementation of a quantum search algorithm on a quantum computer. *Nature*, **393**(6683), 344–346.
- Jones, V. F. R. 1985. A polynomial invariant for knots via von Neumann algebras. *Bulletin of the American Mathematical Society*, **12**, 103–111.
- Joyal, A., and Street, R. 1991. The geometry of tensor calculus I. *Advances in Mathematics*, **88**, 55–112.
- Joyal, A., Street, R., and Verity, D. 1996. Traced monoidal categories. Pages 447–468 of: *Mathematical Proceedings of the Cambridge Philosophical Society*, vol. 119. Cambridge University Press.
- Jozsa, R. 1997. Quantum algorithms and the Fourier transform. In: *Proceedings of the Santa Barbara Conference on Coherence and Decoherence*. Proceedings of the Royal Society of London.
- Kartsaklis, D., and Sadrzadeh, M. 2013. Prior disambiguation of word tensors for constructing sentence vectors. Pages 1590–1601 of: *The 2013 Conference on Empirical Methods on Natural Language Processing*. ACL.
- Kassel, C. 1995. *Quantum Groups*. Vol. 155. Springer.
- Kauffman, L. H. 1987. State models and the Jones polynomial. *Topology*, **26**, 395–407.
- Kauffman, L. H. 1991. *Knots and Physics*. World Scientific.
- Kauffman, L. H. 2005. Teleportation topology. *Optics and Spectroscopy*, **99**, 227–232.
- Kelly, G. M. 1972. Many-variable functorial calculus I. Pages 66–105 of: Kelly, G. M., Laplaza, M., Lewis, G., and Mac Lane, S. (eds), *Coherence in Categories*. Lecture Notes in Mathematics, vol. 281. Springer-Verlag.
- Kelly, G. M., and Laplaza, M. L. 1980. Coherence for compact closed categories. *Journal of Pure and Applied Algebra*, **19**, 193–213.
- Kissinger, A. 2012a. *Pictures of processes: automated graph rewriting for monoidal categories and applications to quantum computing*. PhD thesis, University of Oxford.
- Kissinger, A. 2012b. Synthesising graphical theories. arXiv:1202.6079.
- Kissinger, A. 2014a. Abstract tensor systems as monoidal categories. In: Casadio, C., Coecke, B., Moortgat, M., and Scott, P. (eds), *Categories and Types in Logic, Language, and Physics: Festschrift on the Occasion of Jim Lambek's 90th Birthday*. Lecture Notes in Computer Science, vol. 8222. Springer. arXiv:1308.3586.
- Kissinger, A. 2014b. *Finite matrices are complete for (dagger-)hypergraph categories*. arXiv:1406.5942 [math.CT].

- Kissinger, A., and Zamdzhiev, V. 2015. *Quantomatic: a proof assistant for diagrammatic reasoning*. arXiv:1503.01034.
- Kissinger, A., Merry, A., and Soloviev, M. 2014. Pattern graph rewrite systems. Pages 54–66 of: Löwe, B., and Winskel, G. (eds), *Proceedings 8th International Workshop on Developments in Computational Models*. Electronic Proceedings in Theoretical Computer Science, vol. 143. Open Publishing Association.
- Kochen, S., and Specker, E. P. 1967. The problem of hidden variables in quantum mechanics. *Journal of Mathematics and Mechanics*, **17**(1), 59–87.
- Kock, J. 2004. *Frobenius Algebras and 2D Topological Quantum Field Theories*. Vol. 59. Cambridge University Press.
- Kraus, K. 1983. *States, Effects and Operations*. Springer.
- Lack, S. 2004. Composing PROPs. *Theory and Applications of Categories*, **13**, 147–163.
- Laforest, M., Baugh, J., and Laflamme, R. 2006. Time-reversal formalism applied to maximal bipartite entanglement: theoretical and experimental exploration. *Physical Review A*, **73**(3), 032323.
- Lamata, L., León, J., Salgado, D., and Solano, E. 2007. Inductive entanglement classification of four qubits under stochastic local operations and classical communication. *Physical Review A*, **75**, 022318.
- Lambek, J., and Scott, P. J. 1988. *Introduction to Higher-Order Categorical Logic*. Cambridge University Press.
- Leinster, T. 2004. *Higher Operads, Higher Categories*. Cambridge University Press.
- Lemmens, P. W. H., and Seidel, J. J. 1973. Equiangular lines. *Journal of Algebra*, **24**(3), 494–512.
- Lloyd, S., Maccone, L., Garcia-Patron, R., Giovannetti, V., Shikano, Y., Pirandola, S., Rozema, L. A., Darabi, A., Soudagar, Y., Shalm, L. K., and Steinberg, A. M. 2011. Closed timelike curves via postselection: theory and experimental test of consistency. *Physical Review Letters*, **106**(4), 040403.
- Lo, H.-K., and Popescu, S. 2001. Concentrating entanglement by local actions: beyond mean values. *Physical Review A*, **63**, 022301.
- Ludwig, G. 1985. *An Axiomatic Basis of Quantum Mechanics*, volume 1: *Derivation of Hilbert Space*. Springer-Verlag.
- Mac Lane, S. 1950. Duality for groups. *Bull. Am. Math. Soc.*, **56**, 485–516.
- Mac Lane, S. 1963. Natural associativity and commutativity. *The Rice University Studies*, **49**(4), 28–46.
- Mac Lane, S. 1998. *Categories for the Working Mathematician*. Springer-Verlag.
- Mackey, G. W. 1963. *The Mathematical Foundations of Quantum Mechanics*. New York: W. A. Benjamin.
- Macrakis, K. 1993. *Surviving the Swastika: Scientific Research in Nazi Germany*. Oxford University Press.
- Majid, S. 2000. *Foundations of Quantum Group Theory*. Cambridge University Press.
- Manin, Y. I. 1980. *Vychislimoe i Nevychislimoe*. Sovetskoye Radio.
- Markopoulou, F. 2000. Quantum causal histories. *Classical and Quantum Gravity*, **17**(10), 2059.
- Marvian, I., and Spekkens, R. W. 2013. The theory of manipulations of pure state asymmetry: I. Basic tools, equivalence classes and single copy transformations. *New Journal of Physics*, **15**(3), 033001.
- Mehra, J. 1994. *The Beat of a Different Drum: The Life and Science of Richard Feynman*. Clarendon Press.

- Mellies, P.-A. 2012. Game semantics in string diagrams. Pages 481–490 of: *Proceedings of the 27th Annual IEEE Symposium on Logic in Computer Science (LICS)*. IEEE Computer Society.
- Mermin, N. D. 1990. Quantum mysteries revisited. *American Journal of Physics*, **58**(Aug.), 731–734.
- Mermin, N. D. April 1989. What's wrong with this pillow? *Physics Today*.
- Mermin, N. D. May 2004. Could Feynman have said this? *Physics Today*.
- Milner, R. 1972. *Logic for computable functions; description of a machine implementation*. Tech. rept. STAN-CS-72-288. Stanford University.
- Montanaro, A. 2015. *Quantum algorithms: an overview*. arXiv:1511.04206.
- Moore, D. J. 1995. Categories of representations of physical systems. *Helvetica Physica Acta*, **68**, 658–678.
- Moore, D. J. 1999. On state spaces and property lattices. *Studies in History and Philosophy of Modern Physics*, **30**(1), 61–83.
- Muirhead, R. F. 1903. Some methods applicable to identities and inequalities of symmetric algebraic functions of n letters. *Proceedings of the Edinburgh Mathematical Society*, **21**, 144–157.
- Neumark, M. A. 1943. On spectral functions of a symmetric operator. *Izvestiya Rossiiskoi Akademii Nauk. Seriya Matematicheskaya*, **7**(6), 285–296.
- Nielsen, M. A. 1999. Conditions for a class of entanglement transformations. *Physical Review Letters*, **83**(2), 436–439.
- Nielsen, M. A., and Chuang, I. L. 2010. *Quantum Computation and Quantum Information*. Cambridge University Press.
- Ozawa, M. 1984. Quantum measuring processes of continuous observables. *Journal of Mathematical Physics*, **25**(1), 79–87.
- Pan, J.-W., Bouwmeester, D., Daniell, M., Weinfurter, H., and Zeilinger, A. 2000. Experimental test of quantum nonlocality in three-photon Greenberger–Horne–Zeilinger entanglement. *Nature*, **403**, 515–519.
- Panangaden, P., and Paquette, É. O. 2011. A categorical presentation of quantum computation with anyons. Pages 983–1025 of: Coecke, B. (ed), *New Structures for Physics*. Lecture Notes in Physics. Springer.
- Paquette, É. O. 2008. *Categorical quantum computation*. PhD thesis, University of Montreal.
- Paulsen, V. 2002. *Completely Bounded Maps and Operator Algebras*. Cambridge University Press.
- Paulson, L., et al. 1986. *Isabelle theorem prover*. <https://isabelle.in.tum.de/>.
- Pavlovic, D. 2009. Quantum and classical structures in nondeterministic computation. Pages 143–157 of: *Proceedings of the 3rd International Symposium on Quantum Interaction*. QI '09. Berlin and Heidelberg: Springer-Verlag.
- Pavlovic, D. 2013. Monoidal computer I: basic computability by string diagrams. *Information and Computation*, **226**, 94–116.
- Pearl, J. 2000. *Causality: Models, Reasoning and Inference*. Cambridge University Press.
- Penrose, R. 1971. Applications of negative dimensional tensors. Pages 221–244 of: *Combinatorial Mathematics and Its Applications*. Academic Press.
- Penrose, R. 1984. *Spinors and Spacetime*, vol. 1. Cambridge University Press.
- Penrose, R. 2004. *The Road to Reality: A Complete Guide to the Physical Universe*. Jonathan Cape.
- Perdrix, S. 2005. State transfer instead of teleportation in measurement-based quantum computation. *International Journal of Quantum Information*, **3**(1), 219–223.

- Perdrix, S., and Wang, Q. 2015. *The ZX calculus is incomplete for Clifford+T quantum mechanics*. arXiv:1506.03055.
- Piedeleu, R., Kartsaklis, D., Coecke, B., and Sadrzadeh, M. 2015. Open system categorical quantum semantics in natural language processing. In: *CALCO 2015*. arXiv:1502.00831.
- Pierce, B. C. 1991. *Basic Category Theory for Computer Scientists*. MIT Press.
- Piron, C. 1976. *Foundations of Quantum Physics*. W. A. Benjamin.
- Piron, Constantin. 1964. Axiomatique quantique. *Helvetica Physica Acta*, **37**, 439–468.
- Planck, M. 1900. Zur Theorie des Gesetzes der Energieverteilung im Normalspektrum. *Verhandlungen der Deutschen Physikalischen Gesellschaft*, **2**, 237–245.
- Poincaré, H. 1902. *La science et l'hypothèse*. Flammarion.
- Pusey, M. F., Barrett, J., and Rudolph, T. 2012. On the reality of the quantum state. *Nature Physics*, **8**(6), 475–478.
- Ranchin, A., and Coecke, B. 2014. Complete set of circuit equations for stabilizer quantum mechanics. *Physical Review A*, **90**, 012109.
- Rauch, H., Zeilinger, A., Badurek, G., Wilfing, A., Bauspiess, W., and Bonse, U. 1975. Verification of coherent spinor rotation of fermions. *Physics Letters A*, **54**, 425–427.
- Raussendorf, R., and Briegel, H. J. 2001. A one-way quantum computer. *Physical Review Letters*, **86**, 5188.
- Raussendorf, R., Browne, D. E., and Briegel, H. J. 2003. Measurement-based quantum computation on cluster states. *Physical Review A*, **68**(2), 22312.
- Raussendorf, R., Harrington, J., and Goyal, K. 2007. Topological fault-tolerance in cluster state quantum computation. *New Journal of Physics*, **9**, 199.
- Redei, M. 1996. Why John von Neumann did not like the Hilbert space formalism of quantum mechanics (and what he liked instead). *Studies in History and Philosophy of Modern Physics*, **27**(4), 493–510.
- Redhead, Michael. 1987. *Incompleteness, Nonlocality, and Realism: A Prolegomenon to the Philosophy of Quantum Mechanics*. Clarendon Press.
- Rickles, D. 2007. *Symmetry, Structure, and Spacetime*. Elsevier.
- Roddenberry, G. 1966. *Star Trek* (television series). NBC.
- Rowe, M. A., Kielpinski, D., Meyer, V., Sackett, C. A., Itano, W. M., Monroe, C., and Wineland, D. J. 2001. Experimental violation of a Bell's inequality with efficient detection. *Nature*, **409**, 791–794.
- Sadrzadeh, M., Clark, S., and Coecke, B. 2013. The Frobenius anatomy of word meanings I: subject and object relative pronouns. *Journal of Logic and Computation*, **23**, 1293–1317. arXiv:1404.5278.
- Sadrzadeh, M., Clark, S., and Coecke, B. 2014. The Frobenius anatomy of word meanings II: possessive relative pronouns. *Journal of Logic and Computation*, exu027.
- Schröder de Witt, C., and Zamdzhiev, V. 2014. *The ZX calculus is incomplete for quantum mechanics*. arXiv:1404.3633.
- Schrödinger, E. 1926. An undulatory theory of the mechanics of atoms and molecules. *Physical Review Letters*, **28**(6), 1049–1070.
- Schrödinger, E. 1935. Die gegenwärtige Situation in der Quantenmechanik. *Naturwissenschaften*, **23**, 823–828.
- Schrödinger, E. 1935. Discussion of probability relations between separated systems. *Mathematical Proceedings of the Cambridge Philosophical Society*, **31**, 555–563.
- Schumacher, B. 1995. Quantum coding. *Physical Review A*, **51**, 2738.
- Schwinger, J. 1960. Unitary operator bases. *Proceedings of the National Academy of Sciences of the U.S.A.*, **46**, 570–579.

- Scott, D. S. 1993. A type-theoretical alternative to ISWIM, CUCH, OWHY. *Theoretical Computer Science*, **121**(1), 411–440.
- Selinger, P. 2007. Dagger compact closed categories and completely positive maps. *Electronic Notes in Theoretical Computer Science*, **170**, 139–163.
- Selinger, P. 2011a. Finite dimensional Hilbert spaces are complete for dagger compact closed categories (extended abstract). *Electronic Notes in Theoretical Computer Science*, **270**(1), 113–119.
- Selinger, P. 2011b. A survey of graphical languages for monoidal categories. Pages 275–337 of: Coecke, B. (ed), *New Structures for Physics*. Lecture Notes in Physics. Springer-Verlag. arXiv:0908.3347.
- Selinger, P. 2015. Generators and relations for n-qubit Clifford operators. *Logical Methods in Computer Science*, **11**.
- Shannon, C. E. 1948. A mathematical theory of communication. *The Bell System Technical Journal*, **27**, 379–423.
- Shende, V. V., Bullock, S. S., and Markov, I. L. 2006. Synthesis of quantum-logic circuits. *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, **25**(6), 1000–1010.
- Shor, P. W. 1994. Algorithms for quantum computation: discrete logarithms and factoring. Pages 124–134 of: *Proceedings of the 35th Annual Symposium on Foundations of Computer Science*. IEEE.
- Shor, P. W. 1997. Polynomial-time algorithms for prime factorization and discrete logarithms on a quantum computer. *SIAM Journal on Computing*, **26**(5), 1484–1509.
- Shulman, M., et al. 2013. *Homotopy type theory: univalent foundations of mathematics*. <https://homotopytypetheory.org/book/>.
- Simon, D. R. 1997. On the power of quantum computation. *SIAM Journal on Computing*, **26**(5), 1474–1483.
- Sobocinski, P. 2015. *Graphical linear algebra*. <http://graphicallinearalgebra.net>.
- Spekkens, R. W. 2007. Evidence for the epistemic view of quantum states: a toy theory. *Physical Review A*, **75**(3), 032110.
- Stay, M., and Vicary, J. 2013. Bicategorical semantics for nondeterministic computation. *Electronic Notes in Theoretical Computer Science*, **298**, 367–382. arXiv:1301.3393.
- Stinespring, W. F. 1955. Positive functions on C^* -algebras. *Proceedings of the American Mathematical Society*, **6**(2), 211–216.
- Street, R. 2007. *Quantum Groups: A Path to Current Algebra*. Cambridge University Press.
- Stubbe, I., and van Steirteghem, B. 2007. Propositional systems, Hilbert lattices and generalized Hilbert spaces. Pages 477–524 of: Gabbay, D., Lehmann, D., and Engesser, K. (eds), *Handbook Quantum Logic*. Elsevier Publ.
- Sudarshan, E. C. G., Mathews, P. M., and Rau, J. 1961. Stochastic dynamics of quantum-mechanical systems. *Physical Review*, **121**(3), 920.
- Svetlichny, G. 2009. *Effective quantum time travel*. arXiv:0902.4898.
- Tull, S. 2016. *Operational theories of physics as categories*. arXiv:1602.06284.
- Turing, A. M. 1937. On computable numbers, with an application to the Entscheidungsproblem. *Proceedings of the London Mathematical Society*, **42**, 230–265.
- Van den Nest, M., Dehaene, J., and De Moor, B. 2004. Graphical description of the action of local Clifford transformations on graph states. *Physical Review A*, **69**(2), 9422.
- Verstraete, F., Dehaene, J., De Moor, B., and Verschelde, H. 2002. Four qubits can be entangled in nine different ways. *Physical Review A*, **65**(052112). arXiv:quant-ph/0109033.

- Vicary, J. 2011. Categorical formulation of finite-dimensional quantum algebras. *Communications in Mathematical Physics*, **304**(3), 765–796.
- Vicary, J. 2013. The topology of quantum algorithms. Pages 93–102 of: *Proceedings of the 28th Annual IEEE Symposium on Logic in Computer Science (LICS)*. IEEE Computer Society.
- Von Neumann, J. 1927a. Thermodynamik quantenmechanischer Gesamtheiten. *Nachrichten von der Gesellschaft der Wissenschaften zu Göttingen, Mathematisch-Physikalische Klasse*, **1**, 273–291.
- Von Neumann, J. 1927b. Wahrscheinlichkeitstheoretischer aufbau der quantenmechanik. *Nachrichten von der Gesellschaft der Wissenschaften zu Göttingen, Mathematisch-Physikalische Klasse*, **1**, 245–272.
- Von Neumann, J. 1932. *Mathematische Grundlagen der quantenmechanik*. Springer-Verlag. Translation, *Mathematical Foundations of Quantum Mechanics*, Princeton University Press, 1955.
- Walther, P., Resch, K. J., Rudolph, T., Schenck, E., Weinfurter, H., Vedral, V., Aspelmeyer, M., and Zeilinger, A. 2005. Experimental one-way quantum computing. *Nature*, **434**, 169–176.
- Wedderburn, J. H. M. 1906. On a theorem in hypercomplex numbers. *Proceedings of the Royal Society of Edinburgh*, **26**, 48–50.
- Weih, G., Jennewein, T., Simon, C., Weinfurter, H., and Zeilinger, A. 1998. Violation of Bell's inequality under strict Einstein locality conditions. *Physical Review Letters*, **81**, 5039.
- Werner, R. F. 2001. All teleportation and dense coding schemes. *Journal of Physics A: Mathematical and General*, **34**(35), 7081.
- Whitehead, A. N. 1957. *Process and Reality*. Harper & Row.
- Wigner, E. P. 1931. *Gruppentheorie und ihre Anwendung auf die Quanten mechanik der Atomspektren*. Friedrich Vieweg und Sohn.
- Wigner, E. P. 1995a. *Remarks on the Mind-Body Question*. Springer. Pages 247–260.
- Wigner, E. P. 1995b. The unreasonable effectiveness of mathematics in the natural sciences. Pages 534–549 of: *Philosophical Reflections and Syntheses*. Springer.
- Wilce, A. 2000. Test spaces and orthoalgebras. Pages 81–114 of: Coecke, B., Moore, D. J., and Wilce, A. (eds), *Current Research in Operational Quantum Logic: Algebras, Categories and Languages*. Fundamental Theories of Physics, vol. 111. Springer.
- Wittgenstein, L. 1953. *Philosophical Investigations*. Basil & Blackwell.
- Wood, C. J., and Spekkens, R. W. 2012. *The lesson of causal discovery algorithms for quantum correlations: causal explanations of Bell-inequality violations require fine-tuning*. arXiv:1208.4119.
- Wootters, W., and Zurek, W. 1982. A single quantum cannot be cloned. *Nature*, **299**, 802–803.
- Zeilinger, A. 1999. Experiment and the foundations of quantum physics. *Reviews of Modern Physics*, **71**, S288.
- Zeng, W. 2015. *The abstract structure of quantum algorithms*. PhD thesis, University of Oxford. arXiv:1512.08062.
- Zeng, W., and Vicary, J. 2014. *Abstract structure of unitary oracles for quantum algorithms*. arXiv:1406.1278.
- Zukowski, M., Zeilinger, A., Horne, M. A., and Ekert, A. K. 1993. “Event-ready-detectors” Bell experiment via entanglement swapping. *Physical Review Letters*, **71**, 4287–4290.