

Publications Hans J. Briegel

Preprints

Variational quantum policies for reinforcement learning, S. Jerbi, C. Gyurik, S. Marshall, H. J. Briegel, and V. Dunjko, e-print: arXiv:2103.05577 [quant-ph] (2021).

Operationally meaningful representations of physical systems in neural networks, H. Poulsen Nautrup, T. Metger, R. Iten, S. Jerbi, L. M. Trenkwalder, H. Wilming, H. J. Briegel, and R. Renner, e-print arXiv:2001.00593 [quant-ph] (2020)

Collective defense of honeybee colonies: experimental results and theoretical modeling, Andrea López-Incera, Morgane Nouvian, Katja Ried, Thomas Müller, and Hans J. Briegel, e-print arXiv:2010.07326 [q-bio.PE] (2020).

How a minimal learning agent can infer the existence of unobserved variables in a complex environment, Katja Ried, Ben Eva, Thomas Müller, and Hans J. Briegel, e-print arXiv:1910.06985 [cs.lg]

Refereed and Invited Articles

Quantum enhancements for deep reinforcement learning in large spaces, Sofiene Jerbi, Hendrik Poulsen Nautrup, Lea M. Trenkwalder, Hans J. Briegel, and Vedran Dunjko, PRX Quantum 2, 010328 (2021).

Experimental quantum speed-up in reinforcement learning agents, V. Saggio, B. E. Asenbeck, A. Hamann, T. Strömberg, P. Schiansky, V. Dunjko, N. Friis, N. C. Harris, M. Hochberg, D. Englund, S. Wölk, H. J. Briegel, and P. Walther, Nature 591, 229 (2021).

Entangling logical qubits with lattice surgery, A. Erhard, H. Poulsen Nautrup, M. Meth, L. Postler, R. Stricker, M. Ringbauer, P. Schindler, H. J. Briegel, R. Blatt, N. Friis, and T. Monz, Nature 589, 220 (2021).

Development of swarm behavior in artificial learning agents that adapt to different foraging environments, Andrea López-Incera, Katja Ried, Thomas Müller, and Hans J. Briegel, PLoS ONE 15(12): e0243628 (2020).

Skill Learning by Autonomous Robotic Playing Using Active Learning and Exploratory Behavior Composition, S. Hangl, V. Dunjko, H. J. Briegel, J. Piater, Frontiers in Robotics and AI, vol. 7, 42 (2020).

Machine learning for long-distance quantum communication, J. Wallnöfer, A. A. Melnikov, W. Dür, H. J. Briegel, PRX Quantum 1, 010301 (2020).

On the convergence of projective-simulation-based reinforcement learning in Markov decision processes, W. L. Boyajian, J. Clausen, Lea M. Trenkwalder, V. Dunjko, and H. J. Briegel, Quantum Mach. Intell. 2, 13 (2020)

Photonic architecture for reinforcement learning, F. Flamini, A. Hamann, S. Jerbi, L. M. Trenkwalder, H. Poulsen Nautrup, H. J. Briegel, New J. Phys. 22 045002 (2020).

Optimizing Quantum Error Correction Codes with Reinforcement Learning, H. Poulsen Nautrup, N. Delfosse, V. Dunjko, H. J. Briegel, and N. Friis, *Quantum* 3, 215 (2019).

Simple proof of confidentiality for private quantum channels in noisy environments, A. Pirker, M. Zwerger, V. Dunjko, H. J. Briegel, W. Dür, *Quantum Sci. Technol.* 4, 025009 (2019).

Modelling collective motion based on the principle of agency, K. Ried, T. Müller, H. J. Briegel, *PLOS ONE* 14(2): e0212044 (2019).

Speeding-up the decision making of a learning agent using an ion trap quantum processor, T. Sriarunothai, S. Wölk, G. S. Giri, N. Friis, V. Dunjko, H. J. Briegel, C. Wunderlich, *Quantum Sci. Technol.* 4, 015014 (2019).

Faster quantum mixing for slowly evolving sequences of Markov chains, D. Orsucci, H. J. Briegel, V. Dunjko, *Quantum* 2, 105 (2018).

Benchmarking projective simulation in navigation problems, A. A. Melnikov, A. Makmal, H. J. Briegel, *IEEE Access* 6, 64639 (2018).

A stochastic process model for free agency under indeterminism, T. M. Mueller H. J. Briegel, *dialectica* 72, 219-252 (2018).

Active learning machine learns to create new quantum experiments, A. A. Melnikov, H. Poulsen Nautrup, M. Krenn, V. Dunjko, M. Tiersch, A. Zeilinger, H. J. Briegel, *PNAS* 115 (6), 1221-1226 (2018).

Machine learning and artificial intelligence in the quantum domain: A review of recent progress, V. Dunjko, H. J. Briegel, *Reports on Progress in Physics* 81, 074001 (2018) [arXiv:1709.02779] (2018).

Long-range big quantum-data transmission, M. Zwerger, A. Pirker, V. Dunjko, H. J. Briegel, W. Dür, *Phys. Rev. Lett.* 120, 030503 (2018).

Quantum machine learning with glow for episodic tasks and decision games, J. Clausen, H. J. Briegel, *Phys. Rev. A* 97, 022303 (2018).

Construction of optimal resources for concatenated quantum protocols, A. Pirker, J. Wallnöfer, H. J. Briegel, W. Dür, *Phys. Rev. A* 95, 062332 (2017).

Fault-tolerant interface between quantum memories and quantum processors, H. Poulsen Nautrup, N. Friis, H. J. Briegel, *Nature Communications* 8, 1321 (2017).

Advances in quantum reinforcement learning, V. Dunjko, J.M. Taylor, H.J. Briegel, *IEEE International Conference on Systems, Man and Cybernetics (SMC)*, pp. 282 – 287 (2017).

Projective simulation with generalization, A. A. Melnikov, A. Makmal, V. Dunjko, H. J. Briegel, *Sci. Rep.* 7, 14430 (2017).

Entanglement generation secure against general attacks, A. Pirker, V. Dunjko, W. Dür, H. J. Briegel, *Phys. Rev. A* 95, 062332 (2017).

Flexible resources for quantum metrology, N. Friis, D. Orsucci, M. Skotiniotis, P. Sekatski, V. Dunjko, H. J. Briegel, W. Dür, *New J. Phys.* 19, 063044 (2017).

Construction of optimal resources for concatenated quantum protocols, A. Pirker, J. Wallnöfer, H. J. Briegel, W. Dür, Phys. Rev. A 95, 062102 (2017).

Versatile cluster entangled light, H. J. Briegel, Science 354, 416 (2016).

Quantum-enhanced machine learning, V. Dunjko, J. M. Taylor, H. J. Briegel, Phys. Rev. Lett. 117, 130501 (2016).

Meta-learning within Projective Simulation, A. Makmal, A. A. Melnikov, V. Dunjko, H. J. Briegel, IEEE Access 4, 2110 (2016).

Estimation of coherent error sources from stabilizer measurements, D. Orsucci, M. Tiersch, H. J. Briegel, Phys. Rev. A 93, 042303 (2016).

Measurement-based quantum communication, M. Zwerger, H. J. Briegel, W. Dür, Appl. Phys. B 122, 50 (2016).

Quantum walks on embedded hypercubes: Non-symmetric and non-local cases, A. Makmal, M. Tiersch, C. Ganahl, H. J. Briegel, Phys. Rev. A 93, 022322 (2016).

Coherent controlization using superconducting qubits, N. Friis, A. A. Melnikov, G. Kirchmair, H. J. Briegel, Sci. Rep. 5, 18036 (2015).

Adaptive quantum computation in changing environments using projective simulation, M. Tiersch, E. J. Ganahl, H. J. Briegel, Sci. Rep. 5, 12874 (2015).

A chance for attributable agency, H. J. Briegel, T. Müller, Minds Mach. 25, 261 (2015).

Quantum mixing of Markov chains for special distributions, V. Dunjko, H. J. Briegel, New J. Phys. 17, 073004 (2015).

Quantum-enhanced deliberation of learning agents using trapped ions, V. Dunjko, N. Friis, H. J. Briegel, New J. Phys. 17, 023006 (2015).

Projective simulation for classical learning agents: a comprehensive investigation, J. Mautner, A. Makmal, D. Manzano, M. Tiersch, H. J. Briegel, New Gener. Comput. 33, 69 (2015).

Demonstrating elements of measurement-based quantum error correction, S. Barz, R. Vasconcelos, C. Greganti, M. Zwerger, W. Dür, H. J. Briegel, P. Walther, Phys. Rev. A 90, 042302 (2014).

Quantum walks on embedded hypercubes, A. Makmal, M. Zhu, D. Manzano, M. Tiersch, H. J. Briegel, Phys. Rev. A 90, 022314 (2014).

Multiple re-encounter approach to radical pair reactions and the role of nonlinear master equations, J. Clausen, G. G. Guerreschi, M. Tiersch, H. J. Briegel, J. Chem. Phys. 141, 054107 (2014).

Robustness of hashing protocols for entanglement purification, M. Zwerger, H. J. Briegel, W. Dür, Phys. Rev. A 90, 012314 (2014).

Quantum speedup for active learning agents, G. Paparo, V. Dunjko, A. Makmal, M. A. Martin-Delgado, H. J. Briegel, Phys. Rev. X 4, 031002 (2014).

Reducing space-time to binary information, S. Weinfurter, G. De las Cuevas, M. A. Martin-Delgado, H. J. Briegel, J. Phys. A: Math. Gen. 47 095301 (2014).

Experimental Violation of Multipartite Bell Inequalities with Trapped Ions, B. P. Lanyon, M. Zwerger, P. Jurcevic, C. Hempel, W. Dür, H. J. Briegel, R. Blatt, C. F. Roos, Phys. Rev. Lett. 112 100403 (2014).

Implementing quantum control for unknown subroutines, N. Friis, V. Dunjko, W. Dür, H. J. Briegel, Phys. Rev. A 89, 030303 (2014).

Hybrid architecture for encoded measurement-based quantum computation, M. Zwerger, H. J. Briegel, W. Dür, Scientific Reports 4 5364 (2014).

Approaches to measuring entanglement in chemical magnetometers, M. Tiersch, G. G. Guerreschi, J. Clausen, H. J. Briegel, J. Phys. Chem. A. 118 13 (2014).

Measurement-based quantum computation with trapped ions, B. P. Lanyon, P. Jurcevic, M. Zwerger, C. Hempel, E. A. Martínez, W. Dür, H. J. Briegel, R. Blatt, C. F. Roos, Phys. Rev. Lett. 111 210501 (2013).

Universal and optimal error thresholds for measurement-based entanglement purification, M. Zwerger, H. J. Briegel, W. Dür, Phys. Rev. Lett. 110 260503 (2013).

Heat transport through lattices of quantum harmonic oscillators in arbitrary dimensions, A. Asadian, D. Manzano, M. Tiersch, H.J. Briegel, Phys. Rev. E 87 012109 (2013).

Optical switching of radical pair conformation enhances magnetic sensitivity, G. G. Guerreschi, M. Tiersch, U. Steiner, H. J. Briegel, Chem. Phys. Lett. 572 106 (2013).

Intra-molecular refrigeration in enzymes, H. J. Briegel, S. Popescu, Proc. R. Soc. A 469, 20110290 (2013).

A critical view on transport and entanglement in models of photosynthesis, M. Tiersch, S. Popescu, H. J. Briegel, Phil. Trans. R. Soc. A. 370 377 (2012).

Quantum transport efficiency and Fourier's law, D. Manzano, M. Tiersch, A. Asadian, H. J. Briegel, Phys. Rev. E 86 061118 (2012).

Projective simulation for artificial intelligence, H. J. Briegel, G. De las Cuevas, Scientific Reports **2**, 400 (2012).

On creative machines and the physical origins of free behavior, H. J. Briegel, Scientific Reports **2**, 522 (2012).

Open quantum system approach to the modelling of spin recombination reactions, M. Tiersch, U. Steiner, S. Popescu, H. J. Briegel, J. Phys. Chem. A. 116, 4020 (2012).

Decoherence in the chemical compass: The role of decoherence for avian magnetoreception, M. Tiersch, H. J. Briegel, Phil. Trans. R. Soc. A **370**, 4517 (2012).

Measurement-based quantum repeaters, M. Zwerger, W. Dür, H. J. Briegel, Physical Review A 85, 062326 (2012).

Persistent dynamic entanglement from classical motion: how bio-molecular machines can generate nontrivial quantum states, G. G. Guerreschi, J. Cai, S. Popescu, H. J. Briegel, *New J. Phys.* 14, 053043 (2012).

The $U(1)$ Lattice Gauge Theory Universally Connects All Classical Models with Continuous Variables, Including Background Gravity, Y. Xu, G. De las Cuevas, W. Dür, H. J. Briegel, M. A. Martin-Delgado, *Journal of Statistical Mechanics* P02013 (2011).

Decoherence of many-body systems due to many-body interactions, T. Carle, H. J. Briegel, B. Kraus, *Physical Review A* 84, 012105 (2011).

Universal resources for approximate and stochastic measurement-based quantum computation, C. Mora, M. Piani, A. Miyake, M. van den Nest, W. Dür, H. J. Briegel, *Physical Review A* 81, 042315 (2010).

Universal quantum computer from a quantum magnet, J. Cai, A. Miyake, W. Dür, H. J. Briegel, *Physical Review A* 82, 052309 (2010).

Mapping all classical spin models to a lattice gauge theory, G. De las Cuevas, W. Dür, H. J. Briegel, M. A. Martin-Delgado, *New Journal of Physics* 12, 043014 (2010).

Local renormalization method for random systems, O. Gittsovich, R. Hübener, E. Rico Ortega, H. J. Briegel, *New Journal of Physics* 025020 (2010).

Quantum control and entanglement in a chemical compass, J. Cai, G. G. Guerreschi, H. J. Briegel, *Physical Review Letters* 104, 220502 (2010).

Dynamic entanglement in oscillating molecules and potential biological implications, J. Cai, S. Popescu, H. J. Briegel, *Physical Review E* 82, 021921 (2010).

Motional effects on the efficiency of excitation transfer, A. Asadian, M. Tiersch, G. G. Guerreschi, J. Cai, S. Popescu, H. J. Briegel, *New Journal of Physics* 12, 075019 (2010).

Quantum algorithms for spin models and simulable gate sets for quantum computation, M. Van den Nest, W. Dür, R. Raussendorf, H. J. Briegel, *Physical Review A* 80, 052334 (2009).

Quantum computation in correlation space and extremal entanglement, J. Cai, W. Dür, M. Van den Nest, A. Miyake, H. J. Briegel, *Physical Review Letters* 103, 050503 (2009).

Unifying all classical spin models in a Lattice Gauge Theory, G. De las Cuevas, W. Dür, H. J. Briegel, M. A. Martin-Delgado, *Physical Review Letters* 102, 230502 (2009).

Classical spin systems and the quantum stabilizer formalism: general mappings and applications, R. Hübener, M. Van den Nest, W. Dür, H. J. Briegel, *Journal of Mathematical Physics* 50, 083303 (2009).

Valence Bond States: Link models, E. Rico, R. Hübener, S. Montangero, N. Moran, B. Pirvu, J. Vala, H. J. Briegel, *Annals of Physics* 324, 1875-1896 (2009).

Completeness of classical spin models and universal quantum computation, G. De las Cuevas, W. Dür, M. Van den Nest, H. J. Briegel, *Journal of Statistical Mechanics*, P07001 (2009).

Spin squeezing and entanglement, G. Toth, C. Knapp, O. Gühne, H. J. Briegel, *Physical Review A* 79, 042334 (2009).

Measurement-based quantum computation, H. J. Briegel, D. E. Browne, W. Dür, R. Raussendorf, M. Van den Nest, *Nature Physics* 5 (1), 19-26 (2009).

Graph states as ground states of many-body spin-1/2 Hamiltonians, M. Van den Nest, K. Luttmer, W. Dür, H. J. Briegel, *Physical Review A* 77, 012301 (2008).

Completeness of the classical 2D Ising model and universal quantum computation, M. Van den Nest, W. Dür, H. J. Briegel, *Physical Review Letters* 100, 110501 (2008).

Measurement-based quantum computation and undecidable logic theories, M. Van den Nest, H. J. Briegel, *Foundations of Physics* 38 (5), 448-457 (2008).

2D multipartite valence bond states in quantum anti-ferromagnets, E. Rico, H. J. Briegel, *Annals of Physics* 323 (9), 2115-2131 (2008).

Epsilon-measures of entanglement, C.-E. Mora, M. Piani, H. J. Briegel, *New Journal of Physics* 10, 083027 (2008).

Quantum simulation of interacting high-dimensional systems: The influence of noise, W. Dür, M. Bremner, H. J. Briegel, *Physical Review A* 78, 052325 (2008).

Entanglement and decoherence in spin gases, J. Calsamiglia, L. Hartmann, W. Dür, H. J. Briegel, *International Journal of Quantum Information* 5, 509-523 (2007).

A variational method based on weighted graph states, S. Anders, H. J. Briegel, W. Dür, *New Journal of Physics* 9, 361 (2007).

Entanglement and its dynamics in open, dissipative systems, L. Hartmann, W. Dür, H. J. Briegel, *New Journal of Physics* 9, 230 (2007).

Classical spin models and the quantum stabilizer formalism, M. Van den Nest, W. Dür, H. J. Briegel, *Physical Review Letters* 98, 117207 (2007).

Entanglement purification and quantum error correction, W. Dür, H. J. Briegel, *Reports on Progress in Physics* 70, 1381 (2007).

Parameter estimation for mixed states from a single copy, T. Konrad, O. Gühne, J. Audretsch, H. J. Briegel, *Physical Review A* 75, 062101 (2007).

Optimal spin squeezing inequalities detect bound entanglement in spin models, G. Toth, C. Knapp, O. Gühne, H. J. Briegel, *Physical Review Letters* 99, 250405 (2007).

Fundamentals of universality in one-way quantum computation, M. Van den Nest, W. Dür, A. Miyake, H. J. Briegel, *New Journal of Physics* 9, 204 (2007).

Weighted graph states and applications to spin chains, lattices and gases, L. Hartmann, J. Calsamiglia, W. Dür, H. J. Briegel, *Journal of Physics B: At. Mol. Opt. Phys.* 40, S1-S44 (2007).

On the role of memory errors in quantum repeaters, L. Hartmann, B. Kraus, H. J. Briegel, W. Dür, Physical Review A 75, 032310 (2007).

Classical simulation versus universality in measurement based quantum computation, M. Van den Nest, W. Dür, G. Vidal, H. J. Briegel, Physical Review A 75, 012337 (2007).

Quantum Kolmogorov complexity and its applications, C.-E. Mora, H. J. Briegel, B. Kraus, International Journal of Quantum Information 5, 729 (2007).

Entanglement purification protocols for all graph states, C. Kruszynska, A. Miyake, H. J. Briegel, W. Dür, Physical Review A 74, 052316 (2006).

Universal resources for measurement-based quantum computation, M. Van den Nest, A. Miyake, W. Dür, H. J. Briegel, Physical Review Letters 97, 150504 (2006).

Fast simulation of stabilizer circuits using a graph-state representation, S. Anders, H. J. Briegel, Physical Review A 73, 022334 (2006).

Ground-state approximation for strongly interacting spin systems in arbitrary spatial dimension, S. Anders, M. B. Plenio, W. Dür, F. Verstraete, H. J. Briegel, Physical Review Letters 97, 107206 (2006).

Quantum Information Processing in Disordered and Complex Quantum Systems, A. S. De, U. Sen, V. Ahufinger, H. J. Briegel, A. Sanpera, M. Lewenstein, Physical Review A 74, 062309 (2006).

Protokolle für die Quanteninformaton, W. Dür, H. J. Briegel, Physik Journal 12, 22 (2006).

Steady state entanglement in open and noisy quantum systems at high temperature, L. Hartmann, W. Dür, H. J. Briegel, Physical Review A 74, 052304 (2006).

Optimal purification of thermal graph states, A. Kay, J. K. Pachos, W. Dür, H. J. Briegel, New Journal of Physics 8, 147 (2006).

Quantum communication cost of preparing multipartite entanglement, C. Kruszynska, S. Anders, W. Dür, H. J. Briegel, Physical Review A 73, 062328 (2006).

Algorithmic complexity of quantum states, C.-E. Mora, H. J. Briegel, International Journal of Quantum Information 4, 715 (2006).

Two-setting Bell inequalities for graph states, G. Toth, O. Gühne, H. J. Briegel, Physical Review A 73, 022303 (2006).

Entanglement in graph states and its applications, M. Hein, W. Dür, J. Eisert, R. Raussendorf, H. J. Briegel, Proceedings of the International School of Physics Enrico Fermi (Varenna, Italy), Quantum computers, algorithms and chaos 162 (Eds.: P. Zoller, G. Casati, D. Shepelyansky, G. Benenti) IOS Press (2006); See also quant-ph/0602096.

Multiparticle entanglement purification for two-colorable graph states, H. Aschauer, W. Dür, H. J. Briegel, Physical Review A 71, 012319 (2005).

Spin Gases. Quantum Entanglement Driven by Classical Kinematics, J. Calsamiglia, L. Hartmann, W. Dür, H. J. Briegel, Physical Review Letters 95, 180502 (2005).

Multipartite secure state distribution, W. Dür, J. Calsamiglia, H. J. Briegel, Physical Review A 71, 042336 (2005).

Quantum information processing and communication, P. Zoller, T. Beth, D. Binosi, R. Blatt, H. J. Briegel, D. Bruss et al., Eur. Phys. J. D 36/2 203 – 228 (2005).

Entanglement in spin chains and lattices with long-range Ising-type interactions, W. Dür, L. Hartmann, M. Hein, M. Lewenstein, H. J. Briegel, Physical Review Letters 94, 097203 (2005).

Standard forms of noisy quantum operations via depolarization, W. Dür, M. Hein, J. I. Cirac, H. J. Briegel, Physical Review A 72, 052326 (2005).

Multipartite entanglement in spin chains, O. Gühne, G. Toth, H. J. Briegel, New Journal of Physics 7, 229 (2005).

Bell inequalities for graph states, O. Gühne, G. Toth, P. Hyllus, H. J. Briegel, Physical Review Letters 95, 120405 (2005).

Spin gases as microscopic models for non-Markovian decoherence, L. Hartmann, J. Calsamiglia, W. Dür, H. J. Briegel, Physical Review A 72, 052107 (2005).

Entanglement properties of multipartite entangled states under the influence of decoherence, M. Hein, W. Dür, H. J. Briegel, Physical Review A 71, 032350 (2005).

Distillation of multipartite entanglement by complementary stabilizer measurements, A. Miyake, H. J. Briegel, Physical Review Letters 95, 220501 (2005).

Algorithmic complexity and entanglement of quantum states, C.-E. Mora, H. J. Briegel, Physical Review Letters 72, 022340 (2005).

Local invariants for multi-partite entangled states allowing for a simple entanglement criterion, H. Aschauer, J. Calsamiglia, M. Hein, H. J. Briegel, Quantum Information and Computation (online) 4, 383-395 (2004).

Stability of macroscopic entanglement under decoherence, W. Dür, H. J. Briegel, Physical Review Letters 92, 180403 (2004).

Multiparty entanglement in graph states, M. Hein, J. Eisert, H. J. Briegel, Physical Review A 69, 062311 (2004).

Experimental demonstration of five-photon entanglement and open-destination teleportation, Z. Zhao, Y. A. Chen, A. N. Zhang, T. Yang, H. J. Briegel, J.-W. Pan, Nature 430, 54-58(2004).

Multiparticle entanglement purification for graph states, W. Dür, H. Aschauer, H. J. Briegel, Physical Review Letters 91, 107903 (2003).

Measurement-based quantum computation on cluster states, R. Raussendorf, D. E Browne, H. J. Briegel, Physical Review A 68, 022312 (2003).

Entanglement purification for quantum computation, W. Dür, H. J. Briegel, Physical Review Letters 90, 067901 (2003).

Quantum random walks in optical lattices, W. Dür, R. Raussendorf, V. Kendon, H. J. Briegel, Physical Review A 66, 052319 (2002).

Private entanglement over arbitrary distances, even using a noisy apparatus, H. Aschauer, H. J. Briegel, Physical Review Letters 88, 047902 (2002).

A security proof for quantum cryptography based entirely on entanglement purification, H. Aschauer, H. J. Briegel, Physical Review A 66, 032302 (2002).

Computational model underlying the one-way quantum computer, R. Raussendorf, H. J. Briegel, Quantum Information & Computation 2, 344-386 (2002).

Der Quantenfingerabdruck, H. Aschauer, H. J. Briegel, Physik Journal 1, 22 (2002).

The one-way quantum computer - a non-network model of quantum computation, R. Raussendorf, D.E. Browne, H. J. Briegel, Journal of Modern Optics 49, 1299 (2002).

Entanglement purification with noisy apparatus can be used to factor out an eavesdropper, H. Aschauer, H. J. Briegel, European Physical Journal D 18, 177 (2002).

A one-way quantum computer, R. Raussendorf, H. J. Briegel, Physical Review Letters 86, 5188 (2001).

Persistent entanglement in arrays of interacting particles, J. Briegel, R. Raussendorf, Physical Review Letters 86, 910 (2001).

Schmidt measure as a tool for quantifying multi-particle entanglement, J. Eisert, H. J. Briegel, Physical Review A 64, 022306 (2001).

Quantencomputer und Kryptographie, H. J. Briegel, A. Schenzle, Einsichten Forschung an der LMU München, Nr.18, 26 (2000).

Geheime Schlüssel mit verschränkten Photonen, H. J. Briegel, Physikalische Blätter 56 (6), 12 (2000).

Quantum computing with trapped particles in microscopic potentials, T. Calarco, H. J. Briegel, D. Jaksch, J. I. Cirac, P. Zoller, Fortschritte der Physik 48, 945 (2000).

Entangling atoms for quantum information processing, T. Calarco, H. J. Briegel, D. Jaksch, J.I. Cirac, P. Zoller, Journal of Modern Optics 47, 2137 (2000).

Quantum computing with neutral atoms, H. J. Briegel, T. Calarco, D. Jaksch, J. I. Cirac, P. Zoller, Journal of Modern Optics 47 (2-3), 415-451 (2000).

Quantencomputer: Wie sich Verschränkung für die Informationsverarbeitung nutzen lässt, H. J. Briegel, J. I. Cirac, P. Zoller, Physikalische Blätter 55 (9), 37 (1999).

Entanglement of atoms via cold controlled collisions, D. Jaksch, H. J. Briegel, J. I. Cirac, C. W. Gardiner, P. Zoller, Physical Review Letters 82, 1975 (1999).

Lower bounds for entanglement purification, G. Giedke, H. J. Briegel, J. I. Cirac, P. Zoller, Physical Review A 59, 2641 (1999).

Quantum repeaters based on entanglement purification, W. Dür, H. J. Briegel, J. I. Cirac, P. Zoller, Physical Review A 59, 169 (1999); *ibid.* 60, 729 (1999).

Quantum repeaters: The role of imperfect local operations in quantum communication, H. J. Briegel, W. Dür, J. I. Cirac, P. Zoller, Physical Review Letters 81, 5932 (1998).

Quantum communication and the creation of maximally entangled pairs of atoms over a noisy channel, H. J. Briegel, W. Dür, S. J. van Enk, J. I. Cirac, P. Zoller, Phil. Trans. R. Soc. Lond. A 356, 1841 (1998).

Pump-operator treatment of the ion-trap laser, G. M. Meyer, H. J. Briegel, Physical Review A 58, 3210 (1998).

Ion-trap laser, G. M. Meyer, H. J. Briegel, H. Walther, Europhysics Letters, 37, 317 (1997) .

Spectral properties of a micromaser: Atomic-beam statistics and the field correlation function, H. J. Briegel, B.-G. Englert, M. O. Scully, Physical Review A 54, 3603 (1996).

Dynamic noise reduction in multilevel lasers: Nonlinear theory and the pump-operator approach, H. J. Briegel, G. M. Meyer, B.-G. Englert, Physical Review A 53, 1143 (1996).

Pump operator for lasers with multi-level excitation, H. J. Briegel, G. M. Meyer, B.-G. Englert, Europhysics Letters 33, 515 (1996).

Macroscopic dynamics of a maser with non-Poissonian atomic injection, H. J. Briegel, B.-G. Englert, Physical Review A 52, 2361 (1995).

One-atom maser with periodic and noisy pump: An application of damping bases, H. J. Briegel, B.-G. Englert, C. Ginzl, A. Schenzle, Physical Review A 49, 5019 (1994).

One-atom maser: Statistics of detector clicks, H. J. Briegel, B.-G. Englert, N. Sterpi, H. Walther, Physical Review A 49, 2962 (1994).

Quantum optical master equations: The one-atom laser, C. Ginzl, H. J. Briegel, U. Martini, B.-G. Englert, A. Schenzle, Physical Review A 48, 732 (1993).

Quantum optical master equations: The use of damping bases, H. J. Briegel, B.-G. Englert, Physical Review A 47, 3311 (1993).

Canonical quantization of the classical Hamiltonian for a relativistic spinless particle, H. J. Briegel, B.-G. Englert, G. Süssmann, Z. Naturforsch. 46 A, 933 (1991).

Über die Wurzel aus der Klein-Gordon-Gleichung als Schrödingergleichung eines Spin-0-Teilchens, H. J. Briegel, B.-G. Englert, M. Michaelis, G. Süssmann, Z. Naturforsch. 46 A, 925 (1991).

Invited Book Chapters

One-way quantum computation, D. E. Browne, H. J. Briegel, in *Quantum Information: From Foundations to Quantum Technology Applications*, (eds.: D. Bruss, G. Leuchs), Wiley-VCH Verlag, pp. 449-473 (2016).

Quantum repeater, W. Dür, H. J. Briegel, P. Zoller, P. van Loock, in *Quantum Information: From Foundations to Quantum Technology Applications*, (eds.: D. Bruss, G. Leuchs), Wiley-VCH Verlag, pp. 691-700 (2016).

A perspective on possible manifestations of entanglement in biological systems in "Quantum Effects in Biology", (eds.: M. Mohseni, Y. Omar, G. S. Engel, M. B. Plenio) Cambridge University Press, pp 277-310 (2014).

Cluster States, H. J. Briegel, in *Compendium of Quantum Physics: Concepts Experiments, History and Philosophy*, (eds.: D. Greenberger, K. Hentschel, F. Weinert) Springer Verlag, pp. 96-105 (2009).

Purification and Distillation, W. Dür, H. J. Briegel in "Lectures on Quantum Information" (eds.: D. Bruss, G. Leuchs) Wiley-VCH, pp. 177-208 (2006).

Computational model for the one-way quantum computer: Concepts and Summary, R. Raussendorf, H. J. Briegel in "Quantum Information Processing" (eds.: G. Leuchs, Th. Beth) Wiley, pp. 28-43 (2005).

Quantum communication and decoherence, H. Aschauer and H. J. Briegel in "Coherent evolution in noisy environments" (eds.: A. Buchleitner, K. Hornberger) Springer, pp. 235-262 (2002).

Optical lattices as a playground for studying multiparticle entanglement, H. J. Briegel, R. Raussendorf, A. Schenzle in "Laserphysics at the limit" (eds.: H. Figger, D. Meschede, C. Zimmermann), Springer, pp. 433-477 (2002).

Entanglement purification and long-distance quantum communication, H. J. Briegel in "Quantum computation and quantum information theory" (eds.: C. Macchiavello and G. M Palma and A. Zeilinger) Reprint volume with introductory notes for the ISI TMR Network School. World Scientific, pp. 213–232 (2001).

Quantum information in optical lattices, H. J. Briegel, *ibid.*, World Scientific, pp. 401–424 (2001).

Quantum networks I: Entangling particles at different locations, H. J. Briegel, S. van Enk, J.I. Cirac, P. Zoller, in "The Physics of Quantum Information" (eds.: D. Bouwmeester, A. Ekert, A. Zeilinger) Springer, pp. 192-197 (2000).

Principles of entanglement purification, H. J. Briegel Springer, *ibid.* pp. 261-269 (2000).

Quantum networks II: Communication over noisy channels, H. J. Briegel, W. Dür, J.I. Cirac, P. Zoller, *ibid.*, Springer, pp. 281-285 (2000).

Quantum repeaters for quantum communication, H. J. Briegel, J.I. Cirac, W. Dür, G. Giedke, P. Zoller in "Epistemological and experimental perspectives on quantum physics" (Yearbook 7, 1999 Vienna Circle) Kluwer, pp. 147-154 (1999).

Atom interferometry and the quantum theory of measurement, H. J. Briegel, B.-G. Englert, M. O. Scully, H. Walther in "Atom Interferometry" (ed.: Paul Berman), Academic Press, pp. 217-255 (1997).

