Bibliography

[1] W. Athas. Low-power VLSI techniques for applications in embedded computing. In *IEEE Alessandro Volta Memorial Workshop on Low-Power Design*, pages 14–22. IEEE Computer Society Press, March 1999. Abstract at `http://www.isi.edu/acmos/abstracts/99-04.VOLTA.html`.

[2] W. Athas, N. Tzartzanis, L. Svensson, L. Peterson, H. Li, X. Jiang, P. Wang, and W-C. Liu. AC-1: A clock-powered microprocessor. In *Proc. of the International Symposium on Low-Power Electronics and Design*, Monterey, CA, 18–20 August 1997. `http://www.isi.edu/acmos/papers/97-08.MontereyAC1.ps`.

[3] W. C. Athas, L. "J." Svensson, and N. Tzartzanis. A resonant signal driver for two-phase, almost-non-overlapping clocks. In *ISCAS-96*, 1996.

[4] W. C. Athas, N. Tzartzanis, L. "J." Svensson, and L. Peterson. A low-power microprocessor based on resonant energy. *IEEE Journal of Solid-State Circuits*, 32(11):1693–1701, nov 1997.

[5] William C. Athas, Lars "J." Svensson, Jeffrey G. Koller, Nestoras Tzartzanis, and Eric Ying-Chin Chou. Low-power digital systems based on adiabatic-switching principles. *IEEE Transactions on Very Large Scale Integration (VLSI) Systems*, 2(4):398–407, December 1994.

[6] Stephen Avery and Marwan Jabri. Design of a register file using adiabatic logic. Technical Report SCA-06/06/97, University of Sydney SEDAL, June 1997.

[7] Henry G. Baker. Lively linear lisp—'Look ma, no garbage!'. *ACM SigPlan Notices*, 27(8):89–98, August 1992.

[8] Henry G. Baker. NREVERSAL of fortune — the thermodynamics of garbage collection. In Y. Bekkers, editor, *International Workshop on Memory Management*, pages 507–524. Springer-Verlag, 1992.

[9] Theodore Baker, John Gill, and Robert Solovay. Relativizations of the $\mathcal{P} =? \mathcal{NP}$ question. *SIAM J. Computing*, 4(4):431–442, December 1975.

[10] Adriano Barenco, David Deutsch, Artur K. Ekert, and Richard Jozsa. Conditional quantum dynamics and logic gates. *Physical Review Letters*, 74(20):4083–4086, 15 May 1995. Preprint at Los Alamos Physics Preprint Archive, `http://xxx.lanl.gov/abs/quant-ph/9503017`.

[11] Edward Barton. A reversible computer using conservative logic. Term paper for 6.895 at MIT, 1978.

[12] Matthew E. Becker and Thomas F. Knight, Jr. Transmission line clock driver. In *Power Driven Microarchitecture Workshop*, pages 80–85, Barcelona, Spain, 28 June 1998.

[13] Matthew E. Becker and Thomas F. Knight, Jr. Transmission line clock driver. In *IMAPS Int'l Advanced Technology Wkshp. on Flip Chip Technology*, Braselton, GA, 12–14 March 1999.

[14] Jacob D. Bekenstein. Universal upper bound on entropy-to-energy ratio for bounded systems. *Phys. Rev. D*, 23(2):287–298, January 1981.

[15] Jacob D. Bekenstein. Entropy content and information flow in systems with limited energy. *Phyical Review D*, 30(8):1669–1679, 15 October 1984.

[16] C. H. Bennett. Logical reversibility of computation. *IBM J. Research and Development*, 17(6):525–532, 1973.

[17] C. H. Bennett. The thermodynamics of computation, a review. *International Journal of Theoretical Physics*, 21(12):905–940, 1982.

[18] C. H. Bennett. Notes on the history of reversible computation. *IBM J. Research and Development*, 32(1):16–23, January 1988. Reprinted in [82], ch. 4, pp. 281–288.

[19] C. H. Bennett. Time/space trade-offs for reversible computation. *SIAM J. Computing*, 18(4):766–776, 1989.

[20] Ethan Bernstein and Umesh V. Vazirani. Quantum complexity theory. In *25th Association for Computing Machinery Symposium on the Theory of Computing*, pages 11–20, 1993.

[21] A. Berthiaume and Gilles Brassard. Oracle quantum computing. In *Proceedings of the Workshop on Physics of Computation: PhysComp '92*, pages 195–199, Los Alamitos, CA, 1992. Institute of Electrical and Electronic Engineers Computer Society Press. Also to appear in *Journal of Modern Optics*.

[22] A. Berthiaume and Gilles Brassard. The quantum challenge to structural complexity theory. In *Proceedings of the Seventh Annual Structure in Complexity Theory Conference*, pages 132–137, Los Alamitos, CA, 1992. Institute of Electrical and Electronic Engineers Computer Society Press.

[23] Gianfranco Bilardi and Franco Preparata. Horizons of parallel computation. Technical Report CS-93-20, Brown University, May 1993. Also available on the web at `http://www.cs.brown.edu/publications/techreports/reports/CS-93-20.html`.

[24] Bob Boothe. Algorithms for bidirectional debugging. Technical Report USM/CS-98-2-23, Computer Science Department, University of Southern Maine, 96 Falmouth St, Portland ME 04104-9300, February 1998. Author's email: `boothe@cs.usm.maine.edu`.

[25] A. R. Calderbank and Peter W. Shor. Good quantum error-correcting codes exist. Los Alamos Physics Preprint Archive, `http://xxx.lanl.gov/abs/quant-ph/9512032`, December 1995.

[26] C. S. Calude, J. Casti, and M. J. Dinneen, editors. *Unconventional Models of Computation*. Springer, 1998. (Proc. of the First International Conference on Unconventional Models of Computation (UMC'98), held at the University of Auckland, January 5–9, 1998).

[27] Ruknet Cezzar. Reversible computer apparatus and methods of constructing and utilizing same. U.S. Patent #5,469,550, 21 November 1995.

[28] Anantha P. Chandrakasan and Robert W. Brodersen. *Low Power Digital CMOS Design*. Kluwer Academic Publishers, 1995.

[29] Isaac L. Chuang and Raymond Laflamme. Quantum error correction by coding. Los Alamos Physics Preprint Archive, `http://xxx.lanl.gov/abs/quant-ph/9511003`, November 1995.

[30] Isaac L. Chuang and Yoshihisa Yamamoto. A simple quantum computer. *Physical Review A*, 52:3489–3496, 1995. Preprint at Los Alamos Physics Preprint Archive, `http://xxx.lanl.gov/abs/quant-ph/9505011`.

[31] J. I. Cirac and P. Zoller. Quantum computations with cold trapped ions. *Physical Review Letters*, 74:4091–4094, 1995.

[32] Don Coppersmith and Edna Grossman. Generators for certain alternating groups with applications to cryptography. *Society for Industrial and Applied Mathematics J. Appl. Math.*, 29(4):624–627, December 1975.

[33] David G. Cory, Amr F. Fahmy, and Timothy F. Havel. Ensemble quantum computing by nuclear magnetic resonance spectroscopy. *Proceedings of the National Academy of Sciences of the United States of America*, 94(5):1634–1639, 4 March 1997. See `ftp://deas.ftp.harvard.edu/techreports/tr-10-96.ps.gz`.

[34] David G. Cory, M. D. Price, and T. F. Havel. Nuclear magnetic resonance spectroscopy: An experimentally accessible paradigm for quantum computing. *Physica D*, 120(1–2):82–101, 1 September 1998.

[35] B.C. Crandall and James Lewis, editors. *Nanotechnology: Research and Perspectives.* MIT Press, 1992.

[36] Pierluigi Crescenzi and Christos H. Papadimitriou. Reversible simulation of space-bounded computation. *Theoretical Computer Science*, 143:159–165, 1995.

[37] Defense Advanced Research Projects Agency (DARPA). Scalable computing systems. `http://www.darpa.mil/ito/research/scalable`.

[38] J. S. Denker, S. C. Avery, A. G. Dickinson, A. Kramer, and T. R. Wik. Adiabatic computing with the 2N-2N2D logic family. In *International Workshop on Low Power Design*, pages 183–187, 1994.

[39] David Deutsch and Richard Jozsa. Rapid solution of problems by quantum computation. *Proceedings of the Royal Society of London Ser. A*, A439:553–558, 1992.

[40] Alexander G. Dickinson. Adiabatic logic. U.S. Patent #5,521,538, 28 May 1996. Assigned to AT&T.

[41] David P. DiVincenzo. Two-bit gates are universal for quantum computation. *Physical Review A*, 51(2):1015–1022, February 1995. Also at Los Alamos Physics Preprint Archive, `http://xxx.lanl.gov/abs/cond-mat/9407022`.

[42] M. Dorojevets, P. Bunyk, D. Zinoviev, and K. Likharev. COOL-0: an RSFQ subsystem design for petaflops computing. *IEEE Trans. on Appl. Supercond.*, jun 1999.

[43] K. Eric Drexler. *Nanosystems: Molecular Machinery, Manufacturing, and Computation.* John Wiley & Sons, Inc., 1992. `http://nano.xerox.com/nanotech/nanosystems.html`.

[44] François Englert. On the black hole unitarity issue. Los Alamos e-print `http://xxx.lanl.gov/abs/hep-th/9705115`, 15 May 1997.

[45] T. Pellizzari *et al.* Decoherence, continuous observation and quantum computing: a cavity QED model. Preprint, June 1995. University of Innsbruck.

[46] Hugh Everett, III. The theory of the universal wave function. In Bryce S. DeWitt and Neill Graham, editors, *The Many-Worlds Interpretation of Quantum Mechanics*, pages 3–139. Princeton University Press, 1973.

[47] William Feller. *An Introduction to Probability Theory and Its Applications.* John Wiley & Sons, Inc., 1950.

[48] Richard Feynman. Quantum mechanical computers. *Optics News*, 11, 1985. Also in *Foundations of Physics*, 16(6):507–531, 1986.

[49] David J. Frank. CMOS toggle flip-flop using adiabatic switching. U.S. Patent #5,517,145, 4 May 1996. Assigned to IBM.

[50] David J. Frank. Static combinatortial logic circuits for reversible computation. U.S. Patent #5,493,240, 20 February 1996. Assigned to IBM.

[51] David J. Frank and Paul M. Solomon. Energy conserving clock pulse generating circuits. U.S. Patent #5,506,520, 9 April 1996. Assigned to IBM.

[52] Michael Frank. Time-symmetric control-flow instructions for less garbage in reversible programs. MIT Reversible Computing Project Internal Memo #M1, February 1996. `http://www.ai.mit.edu/~mpf/rc/memos/M01_symmarch.html`.

[53] Michael Frank and Scott Rixner. Tick: A simple reversible processor (6.371 project report). Online term paper, May 1996. `http://www.ai.mit.edu/~mpf/rc/tick-report.ps`.

[54] Michael P. Frank. Low-energy computing for implantable medical devices. Talk presented to the MIT Clinical Decision Making Group, `http://www.ai.mit.edu/~mpf/rc/MedG_talk/webpage.html`, 21 February 1996.

[55] Michael P. Frank. Modifications to PISA architecture to support guaranteed reveribility and other features. MIT Reversible Computing Project Internal Memo #M7, February 1997. http://www.ai.mit.edu/~mpf/rc/memos/M07/M07_revarch.html.

[56] Michael P. Frank. Voltage scaling and limits to energy efficiency for CMOS-based SCRL. MIT Reversible Computing Project Internal Memo #M3, April 1997. Unfinished draft at http://www.ai.mit.edu/~mpf/rc/memos/M03_scrllimits.html.

[57] Michael P. Frank and M. Josephine Ammer. Separations of reversible and irreversible space-time complexity classes. Extended abstract submitted to FOCS-97. http://www.ai.mit.edu/~mpf/rc/memos/M06_oracle.html, 1997.

[58] Michael P. Frank and Thomas F. Knight, Jr. Ultimate theoretical models of nanocomputers. *Nanotechnology*, 9(3):162–176, 1998. Presented at the Fifth Foresight Conference on Molecular Nanotechnology, Palo Alto, CA, November 1997. http://www.ai.mit.edu/~mpf/Nano97/paper.html.

[59] Michael P. Frank, Thomas F. Knight, Jr., and Norman H. Margolus. Reversibility in optimally scalable computer architectures. In Calude et al. [26], pages 165–182. http://www.ai.mit.edu/~mpf/rc/scaling_paper/scaling.html.

[60] Michael P. Frank, Carlin Vieri, M. Josephine Ammer, Nicole Love, Norman H. Margolus, and Thomas F. Knight, Jr. A scalable reversible computer in silicon. In Calude et al. [26], pages 183–200. http://www.ai.mit.edu/~mpf/rc/flattop/ft.html.

[61] E. F. Fredkin and T. Toffoli. Design principles for achieving high-performance submicron digital technologies. DARPA Proposal, November 1978.

[62] E. F. Fredkin and T. Toffoli. Conservative logic. *International Journal of Theoretical Physics*, 21(3/4):219–253, 1982.

[63] Ed Fredkin. Feynman, Barton and the reversible Schrödinger difference equation. In Hey [68], chapter 20, pages 337–348.

[64] Neil A. Gershenfeld and Isaac L. Chuang. Bulk spin resonance quantum computation. *Science*, 275(350), jan 1997.

[65] J. Storrs Hall. An electroid switching model for reversible computer architectures. In PhysComp92 [109], pages 237–247.

[66] J. Storrs Hall. An electroid switching model for reversible computer architectures. In *Proc. ICCI '92, 4th Int'l Conf. on Computing and Information*, 1992.

[67] J. Storrs Hall. A reversible instruction set architecture and algorithms. In PhysComp94 [110], pages 128–134.

[68] Anthony J. G. Hey, editor. *Feynman and Computation: Exploring the Limits of Computers*. Perseus Books, Reading, MA, 1999.

[69] R. T. Hinman and M. F. Schlecht. Recovered energy logic: A single clock AC logic. In *International Workshop on Low Power Design*, pages 153–158, 1994.

[70] David A. Hodges and Horace G. Jackson. *Analysis and Design of Digital Integrated Circuits*. McGraw-Hill, Inc., second edition, 1988.

[71] John E. Hopcroft and Jeffrey D. Ullman. *Introduction to Automata Theory, Languages, and Computation*. Addison-Wesley Series in Computer Science. Addison-Wesley, 1979.

[72] K. Huang. *Statistical Mechanics*. Wiley, 1963.

[73] E. Joos and A. Qadir. A quantum statistical upper bound on entropy. *Il Nuovo Cimento*, 107B(5):563–572, 1992.

[74] Thomas F. Knight, Jr. and Saed Younis. Charge recovery logic including split level logic. U.S. Patent #5,378,940, 3 January 1995. Assigned to MIT.

[75] Tom Knight. An architecture for mostly functional languages. In Patrick Henry Winston and Sarah Alexandra Shellard, editors, *Artificial Intelligence at MIT: Expanding Frontiers*, volume 1, chapter 19, pages 500–519. The MIT Press, Cambridge, Massachusetts, 1990.

[76] J. G. Koller and W. C. Athas. Adiabatic switching, low energy computing, and the physics of storing and erasing information. In PhysComp92 [109], pages 267–270.

[77] A. Kramer, J. S. Denker, S. C. Avery, A. G. Dickinson, and T. R. Wik. Adiabatic computing with the 2N-2N2D logic family. In *1994 Symp. VLSI Circ.: Digest of Tech. Papers*. Institute of Electrical and Electronic Engineers Press, June 1994.

[78] A. Kramer, J. S. Denker, B. Flower, and J. Moroney. 2nd order adiabatic computation with 2N-2P and 2N-2N2P logic circuits. In *Intl. Symposium on Low Power Devices*, pages 191–196, Dana Point, CA, 1995. ACM.

[79] Rolf Landauer. Irreversibility and heat generation in the computing process. *IBM J. Research and Development*, 5:183–191, 1961. Reprinted in [82], ch. 4, pp. 188–196.

[80] Klaus-Jörn Lange, Pierre McKenzie, and Alain Tapp. Reversible space equals deterministic space. In *Proc. 12th Annual IEEE Conf. on Computational Complexity (CCC '97)*, pages 45–50, June 1997. `http://www.iro.umontreal.ca/~tappa/Publications/LMT'97_abstract.html`.

[81] Y. Lecerf. Machines de Turing réversibles. Insolubilité récursive en $n \in N$ de l'équation $u = \theta^n$, où θ est un $\ll$ isomorphisme de codes $\gg$ [Reversible Turing machines. Recursive insolubility in $n \in N$ of the equation $u = \theta^n$, where θ is an "isomorphism of codes"]. *Comptes Rendus Hebdomadaires des Séances de L'académie des Sciences [Weekly Proceedings of the Academy of Science]*, 257:2597–2600, October 28, 1963. Unauthorized English translation at `http://www.ai.mit.edu/~mpf/rc/Lecerf/lecerf.html`.

[82] Harvey S. Leff and Andrew F. Rex, editors. *Maxwell's demon: entropy, information, computing*. Princeton series in physics. Princeton University Press, Princeton, NJ, 1990. May be ordered through `http://www.ioppublishing.com/Books/Catalogue/020/__26/0750300566`.

[83] F. Thomson Leighton. *Introduction to Parallel Algorithms and Architectures: Arrays · Trees · Hypercubes*. Morgan Kaufmann Publishers, San Mateo, California, 1992.

[84] Robert Y. Levine and Alan T. Sherman. A note on Bennett's time-space tradeoff for reversible computation. *SIAM J. Computing*, 19(4):673–677, 1990.

[85] Ming Li and Paul Vitányi. *An Introduction to Kolmogorov Complexity and Its Applications*. Graduate Texts in Computer Science. Springer-Verlag, 2nd edition, 1997.

[86] Ming Li and Paul M. B. Vitányi. Reversibility and adiabatic computation: trading time and space for energy. *Proceedings of the Royal Society of London Ser. A*, 452:1–21, 1996.

[87] Ming Li and Paul M. B. Vitányi. Reversible simulation of irreversible computation. In *Proc. 11th IEEE Conference on Computational Complexity*, Philadelphia, Pennsylvania, May 24–27, 1996.

[88] K. K. Likharev. Classical and quantum limitations on energy consumption in computation. *International Journal of Theoretical Physics*, 21(3/4):311–326, 1982.

[89] K. K. Likharev. Rapid single-flux-quantum logic. `http://pavel.physics.sunysb.edu/RSFQ/Research/WhatIs/rsfqre2m.html`, 1992.

[90] Konstantin K. Likharev. Rapid single flux quantum (RSFQ) superconductor electronics. See `http://pavel.physics.sunysb.edu/RSFQ/Research/WhatIs/rsfqwte1.html`, may 1996.

[91] Konstantin K. Likharev and Alexander N. Korotkov. "Single-electron parametron": Reversible computation in a discrete-state system. *Science*, 273:763–765, 9 August 1996.

[92] Chris Lutz. Janus: A time-reversible language. Letter from Chris Lutz to Rolf Landauer. Unauthorized reproduction at `http://www.ai.mit.edu/~mpf/rc/janus.html`, 1 April 1986.

[93] N. H. Margolus. *Physics and Computation*. PhD thesis, Massachusetts Institute of Technology, 1988.

[94] Norman Margolus. Physics-like models of computation. *Physica D*, 10:81–95, 1984.

[95] Norman Margolus. Crystalline computation. In Hey [68], chapter 18, pages 267–305.

[96] Norman Margolus and Lev B. Levitin. The maximum speed of dynamical evolution. In Toffoli et al. [137], pages 208–211. Available through `http://www.interjournal.org`. Revised version available at `ftp://im.lcs.mit.edu/poc/margolus/speed.of.dynamics.ps.Z`.

[97] Norman Margolus, Tommaso Toffoli, and Gérard Vichniac. Cellular-automata supercomputers for fluid dynamics modeling. *Phys. Rev. Lett.*, 56(16):1694–1696, 21 April 1986.

[98] Vladimir S. Mashkevich. Conservative model of black hole (sic) and lifting of the information loss paradox. Los Alamos e-print `http://xxx.lanl.gov/abs/gr-qc/9707055`, 27 July 1997.

[99] Carver A. Mead. Scaling of MOS technology to submicrometer feature sizes. *Journal of VLSI Signal Processing*, 8:9–25, 1994. Reprinted as chapter 9 of [68].

[100] Ralph C. Merkle. Towards practical reversible logic. In PhysComp92 [109], pages 227–228.

[101] Ralph C. Merkle. Reversible electronic logic using switches. *Nanotechnology*, 4:21–40, 1993.

[102] Ralph C. Merkle. Two types of mechanical reversible logic. *Nanotechnology*, 4:114–131, 1993.

[103] Ralph C. Merkle. Reversible charge transfer and logic utilizing them. U.S. Patent #5,357,548, 18 October 1994. Assigned to Xerox.

[104] Ralph C. Merkle and K. Eric Drexler. Helical logic. *Nanotechnology*, 7(4):325–339, 1996. Available through `http://www.ioppublishing.com`.

[105] C. D. Motchenbacher and J. A. Connelly. *Low-Noise Electronic System Design.* John Wiley & Sons, Inc., 1993.

[106] Robert C. Myers. Pure states don't wear black. Los Alamos e-print `http://xxx.lanl.gov/abs/gr-qc/9705065`, May 1997.

[107] William J. Ooms and Jerald A. Hallmark. Complementary logic recovered energy circuit. U.S. Patent #5,426,382, 20 June 1995. Assigned to Motorola.

[108] Christos H. Papadimitriou. *Computational Complexity.* Addison-Wesley, 1994.

[109] *PhysComp '92: Proceedings of the Workshop on Physics and Computation, October 2–4, 1992, Dallas, Texas*, Los Alamitos, CA, 1992. IEEE Computer Society Press.

[110] *PhysComp '94: Proceedings of the Workshop on Physics and Computation, November 17–20, 1994, Dallas, Texas*, Los Alamitos, CA, 1994. IEEE Computer Society Press.

[111] J. E. Pin. On the languages accepted by finite reversible automata. In Thomas Ottman, editor, *Automata, Languages and Programming, Proc. 14th Int'l Colloq. (ICALP)*, volume 267 of *Lecture Notes in Computer Science*, pages 237–249. Springer-Verlag, 1987.

[112] M. Planck. *The Theory of Heat Radiation.* Dover, New York, 1991.

[113] John Preskill. Do black holes destroy information? Los Alamos e-print `http://xxx.lanl.gov/abs/hep-th/9209058`, September 1992.

[114] J.M. Rabaey. *Digital Integrated Circuits: A Design Perspective.* Prentice-Hall, 1996. `http://infopad.EECS.Berkeley.EDU/~icdesign`.

[115] A. L. Ressler. The design of a conservative logic computer and a graphical editor simulator. Master's thesis, MIT Artificial Intelligence Laboratory, 1981.

[116] Hartley Rogers, Jr. *Theory of Recursive Functions and Effective Computability.* The MIT Press, first mit press paperback edition edition, 1987. Original edition published by McGraw-Hill Book Company, 1967.

[117] Martin F. Schlecht and Roderick T. Hinman. Recovered energy logic circuits. U.S. Patent #5,396,527, 7 March 1995. Assigned to MIT.

[118] Francis W. Sears, Mark W. Zemansky, and Hugh D. Young. *University Physics.* Addison-Wesley Series in Physics. Addison-Wesley Publishing Company, Reading, Massachusetts, sixth edition, February 1984.

[119] Charles L. Seitz, Alexander H. Frey, Sven Mattisson, Steve D. Rabin, Don A. Speck, and Jan L. A. van de Snepscheut. Hot-clock nMOS. In Henry Fuchs, editor, *1985 Chapel Hill Conference on Very Large Scale Integration*, pages 1–17. Computer Science Press, 1985.

[120] Semiconductor Industry Association. *The National Technology Roadmap for Semiconductors: Technology Needs.* SEMATECH, Inc., 1997 edition, 1997. `http://notes.sematech.org/ntrs/Rdmpmem.nsf`.

[121] Peter W. Shor. Algorithms for quantum computation: Discrete log and factoring. In *Proceedings of the 35th Annual Symposium on Foundations of Computer Science*, pages 124–134. Institute of Electrical and Electronic Engineers Computer Society Press, November 1994. `ftp://netlib.att.com/netlib/att/math/shor/quantum.algorithms.ps.Z`.

[122] Hava (Eve) Tova Siegelmann. *Foundations of Recurrent Neural Networks.* PhD thesis, Rutgers University, 1993.

[123] David R. Simon. On the power of quantum computation. In *Proceedings of the 35th Annual Symposium on Foundations of Computer Science*, pages 116–123, Los Alamitos, CA, 1994. Institute of Electrical and Electronic Engineers Computer Society Press. Preprint at `http://vesta.physics.ucla.edu/cgi-bin/uncompress_ps_cgi?simon94.ps`. Improves on Bernstein & Vazirani '93 [20]. Shor '94 [121] was inspired by this.

[124] Tycho Sleator and Harald Weinfurter. Realizable universal quantum logic gates. *Physical Review Letters*, 74:4087–4090, 1995. Proposes a universal gate and a Cavity QED implementation.

[125] Warren D. Smith. Church's thesis meets the N-body problem. Technical Report TM 93-105-3-0058-6, NECI, September 1993. `http://www.neci.nj.nec.com/homepages/wds/church.ps`.

[126] Warren D. Smith. Fundamental physical limits on computation. Technical report, NECI, May 1995. `http://www.neci.nj.nec.com/homepages/wds/fundphys.ps`.

[127] Paul M. Solomon and David J. Frank. Power measurements of adiabatic circuits by thermoelectric technique. In *Symposium on Low Power Electronics*, pages 18–19, 1995.

[128] Dinesh Somasekhar, Yibin Ye, and Kaushik Roy. An energy recovery static RAM memory core. In *Symposium on Low Power Electronics*, pages 62–63, 1995.

[129] Andrew Steane. Multiple particle interference and quantum error correction. *Proceedings of the Royal Society of London Ser. A*, 1996. (Submitted.) Preprint available at Los Alamos Physics Preprint Archive, `http://xxx.lanl.gov/abs/quant-ph/9601029`. Introduces a parity encoding for quantum error correction.

[130] L. "J." Svensson and J. G. Koller. Adiabatic charging without inductors. In *Proc. Int'l Workshop on Low-Power Design*, pages 159–164, apr 1994.

[131] Lars Svensson. Adiabatic switching. In *Low Power Digital CMOS Design* [28], chapter 6, pages 181–218.

[132] W. G. Teich, K. Obermayer, and G. Mahler. Structural basis of multistationary quantum systems *ii*: Effective few-particle dynamics. *Physical Review B*, 37:8111–8121, 1988.

[133] Steven D. Thomas. Precharged adiabatic pipelined logic. U.S. Patent #5,602,497, 11 February 1997.

[134] Tommaso Toffoli. Computation and construction universality of reversible cellular automata. *J. Computer and System Sciences*, 15:213–231, 1977.

[135] Tommaso Toffoli. Reversible computing. Technical memo MIT/LCS/TM-151, MIT Lab for Computer Science, February 1980. Out of print; available from NTIS. Abridged version available as [136].

[136] Tommaso Toffoli. Reversible computing. In J. W. de Bakker and J. van Leeuwen, editors, *Automata, Languages and Programming (Seventh Colloquium, Noordwijkerhout, the Netherlands, July 14–18, 1980)*, volume 85 of

Lecture Notes in Computer Science, pages 632–644. Springer-Verlag, 1980. Abridged version of [135].

[137] Tommaso Toffoli, Michael Biafore, and João Leão, editors. *PhysComp96 (Proceedings of the Fourth Workshop of Physics and Computation, Boston University, 22–24 November 1996)*. New England Complex Systems Institute, 1996. Copies may be ordered from *PhysComp96*, 44 Cummington St., Boston MA 02215 (`PhysComp96@pm.bu.edu`). Individual papers are available through `http://www.interjournal.org`.

[138] Tommaso Toffoli and Norman Margolus. *Cellular Automata Machines: A New Environment for Modeling*. MIT Press, 1987.

[139] Kai-Yap Toh, Ping-Keung Ko, and Robert G. Meyer. An engineering model for short-channel MOS devices. *IEEE Journal of Solid-State Circuits*, 23(4):950–958, August 1988.

[140] D. B. Tuckerman and R. F. W. Pease. High-performance heat sinking for VLSI. *IEEE Electron Device Letters*, EDL-2(5):126–129, May 1981.

[141] David Bazeley Tuckerman. *Heat-Transfer Microstructures for Integrated Circuits*. PhD thesis, Stanford University, February 1984.

[142] Q. A. Turchette, C. J. Hood, W. Lange, H. Mabuchi, and H. Jeffrey Kimble. Measurement of conditional phase shifts for quantum logic. Submitted to Physical Review Letters. Abstract at `http://www.cco.caltech.edu/~hood/QO/Abstracts/Turc95b.html`.

[143] A. M. Turing. On computable numbers, with an application to the *entscheidungsproblem*. *Proc. London Math. Society*, 2(42):230–265, 1936. Also no. 43, pp. 544–546, 1937.

[144] N. Tzartzanis and W. Athas. Clock-powered CMOS: A hybrid adiabatic logic style for power-efficient computing. In *20th Anniversary Conference on Advanced Research in VLSI*, pages 137–151. IEEE Computer Society Press, March 1999. Slides at `http://www.isi.edu/acmos/presentations/99-03.ARVLSI.-pdf`.

[145] Nestoras Tzartzanis and William C. Athas. Energy recovery for the design of high-speed, low power static RAMs. In *International Symposium on Low Power Electronics and Design*, pages 55–60, 1996.

[146] David Ungar, Henry Lieberman, and Christopher Fry. Debugging and the experience of immediacy. *Communications of the ACM*, 40(4):38–43, April 1997.

[147] P. van Emde Boas. Machine models and simulations. In J. van Leeuwen, editor, *Handbook of Theoretical Computer Science*, volume A, pages 1–66. Elsevier, Amsterdam, 1990.

[148] A. Vergis, K. Steiglitz, and B. Dickinson. The complexity of analog computation. *Math. and Computers in Simulation*, 28:91–113, 1986. .

[149] Anastasios Vergis, Kenneth Steiglitz, and Bradley Dickinson. The complexity of analog computation. *Mathematics and Computers in Simulation*, 28:91–113, 1986.

[150] Carlin Vieri. *Reversible Computer Engineering and Architecture*. PhD thesis, Massachusetts Institute of Technology, 1999.

[151] Carlin J. Vieri. Pendulum: A reversible computer architecture. Master's thesis, MIT Artificial Intelligence Laboratory, 1995.

[152] Paul M. B. Vitányi. Locality, communication and interconnect length in multicomputers. *SIAM J. Computing*, 17:659–672, 1988.

[153] J. von Neumann. Non-linear capacitance or inductance switching, amplifying, and memory organs. U.S. Patent #2,815,488, December 3, 1957. Assigned to IBM.

[154] John von Neumann. *Theory of Self-Reproducing Automata*. University of Illinois Press, 1966.

[155] L. Wang. On the classical limit of phase-space formulation of quantum mechanics: entropy. *J. Math. Phys.*, 27:483–487, 1986.

[156] Steve Ward, John Nguyen, and John Pezaris. 3D-3N meshes. MIT LCS NuMesh project internal memo, sep 1991. `http://www.cag.lcs.mit.edu/numesh/papers/memos/3d3n.html`.

[157] Boyd G. Watkins. A low-power multiphase circuit technique. *IEEE Journal of Solid-State Circuits*, pages 213–220, December 1967.

[158] Neil H. E. Weste and Kamran Eshraghian. *Principles of CMOS VLSI Design: A Systems Perspective*. Addison-Wesley, second edition, 1993.

[159] R. L. Wigington. A new concept in computing. *Proceedings of the IRE*, 47:516–523, April 1961.

[160] Yibin Ye and Kaushik Roy. Energy recovery circuits using reversible and partially reversible logic. *IEEE Transactions on Circuits and Systems—I: Fundamental Theory and Applications*, 43(9):769–778, sep 1996.

[161] S. G. Younis. *Asymptotically Zero Energy Computing Using Split-Level Charge Recovery Logic.* PhD thesis, MIT Artificial Intelligence Laboratory, 1994.

[162] S. G. Younis and T. F. Knight, Jr. Practical implementation of charge recovering asymptotically zero power CMOS. In *Proc. 1993 Symp. on Integrated Systems*, pages 234–250. MIT Press, 1993.

[163] S. G. Younis and T. F. Knight, Jr. Asymptotically zero energy split-level charge recovery logic. In *International Workshop on Low Power Design*, pages 177–182, 1994.

[164] S. G. Younis and T. F. Knight, Jr. Harmonic resonant rail drivers for adiabatic logic. In *Proceedings of the 1995 Symposium on Advanced Research in VLSI.* MIT Press, 1995.

[165] D. Zinoviev. Design issues in ultra-fast ultra-low-power superconductor batcher-banyan switching fabric based on RSFQ logic/memory family. *Applied Superconductivity*, 5(7–12):235–239, aug 1998.

That's all, folks!