

# Annotated Bibliographies

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## Memristors for the Curious Outsiders

Caravelli, Francesco, and Juan Carbajal. “Memristors for the Curious Outsiders.” *Technologies* 6.4 (2018): 118. Crossref. Web.

1. Caravelli, Francesco, and Juan Carbajal.
2. Peer-reviewed journal article.
3. Authors refer to secondary research and offer a meta-analysis.
4. An overview is given on a relatively new technology called “Memristors”. Which has a number of interesting properties. For instance, from what I understand, such is immune to radiation, and is non-volatile (you can power up your computer without loss of information). It’s forty-eight pages in total, and here, i’m only concerned with the latter part that pertains to analog computing.
5. None given.
6. I plan to use such in my analysis of analog computing.

## Neural Networks and Analog Computation Beyond the Turing Limit

Hava T. Siegelmann. 1999. *Neural networks and analog computation: beyond the Turing limit*. Birkhauser Boston Inc.

1. Hava T. Siegelmann.
2. Peer-reviewed journal article.
3. Authors refer to secondary research and offer a meta-analysis.
4. Discusses analog computation in the context of artificial neural networks.
5. None given.
6. I plan to use such in my analysis of analog computing.

## **Quantum Computing with Analog Circuits: Hilbert Space Computing**

Kish, Laszlo. (2003). Quantum Computing with Analog Circuits: Hilbert Space Computing. Proceedings of SPIE - The International Society for Optical Engineering. 5055. 10.1117/12.497438.

1. Kish, Laszlo.
2. Peer-reviewed journal article.
3. Authors refer to secondary research and offer a meta-analysis.
4. The author postulates that Quantum Computing may be implemented in a commercially viable manner as a classical analog computer.
5. None given.
6. I plan to use such in my analysis of analog computing.

## **A Review of Analog Computing**

MacLennan, Bruce (2007). A review of analog computing. Technical Report CS-07-601, Department of Electrical Engineering & Computer Science. University of Tennessee, Knoxville

1. MacLennan, Bruce.
2. Peer-reviewed journal article.
3. Authors refer to secondary research and offer a meta-analysis.
4. The author gives an overview of analog computing.
5. None given.
6. I plan to use such in my analysis of analog computing.

## Computability of analog networks

John V. Tucker and Jeffery I. Zucker. 2007. Computability of analog networks. *Theor. Comput. Sci.* 371, 1–2 (February, 2007), 115–146. DOI:<https://doi.org/10.1016/j.tcs.2006.10.018>

1. John V. Tucker and Jeffery I. Zucker.
2. Peer-reviewed journal article.
3. Authors refer to secondary research and offer a meta-analysis.
4. The authors discusses an implementation of analog computing with respect to a global continuous clock.
5. None given.
6. I plan to use such in my analysis of analog computing.

## It's an analog world

Sauro, H., Kim, K. It's an analog world. *Nature* 497, 572–573 (2013). <https://doi.org/10.1038/nature12246>

1. John V. Tucker and Jeffery I. Zucker.
2. Peer-reviewed journal article.

3. Authors refer to secondary research and offer a meta-analysis.
4. The authors discuss implementing functional circuits in living systems based on an analog model.
5. None given.
6. I plan to use such in my analysis of analog computing.

## Analog synthetic biology

Sarpeshkar, R. “Analog synthetic biology.” *Philosophical transactions. Series A, Mathematical, physical, and engineering sciences* vol. 372,2012 20130110. 24 Feb. 2014, doi:10.1098/rsta.2013.0110

1. John V. Tucker and Jeffery I. Zucker.
2. Peer-reviewed journal article.
3. Authors refer to secondary research and offer a meta-analysis.
4. The author discusses analog computing in the context of systems biology, both in terms of encoding computation in biological systems, and from the perspective of simulating these very same systems electronically. Furthermore, the author postulates that there exists a deep connection between electrons and chemistry, in the sense that we can define an isomorphism (my own words) between the chemistry that manifests real life, and modeling the very same systems ‘electronically’.
5. None given.
6. I plan to use such in my analysis of analog computing.

To elaborate on this isomorphism, this is how the author put it,

“electron concentration at the source is analogous to reactant concentration; electron concentration at the drain is analogous to product concentration; forward and reverse current flows in the transistor are analogous to forward and reverse reaction rates in a chemical reaction; the forward and reverse currents in a transistor are exponential in voltage differences at its terminals

analogous to reaction rates being exponential in the free-energy differences in a chemical reaction; increases in gate voltage lower energy barriers in a transistor increasing current flow analogous to the effects of enzymes or catalysts in chemical reactions that increase reaction rates; and the stochastics of the Poisson shot noise in subthreshold transistors are analogous to the stochastics of molecular shot noise in reactions”.

Amount other things (the overall paper was twenty-two pages long).

## Computation Beyond the Turing Limit

Siegelmann, H T. “Computation beyond the turing limit.” *Science* (New York, N.Y.) vol. 268,5210 (1995): 545-8. doi:10.1126/science.268.5210.545

1. Siegelmann, Hava.
2. Peer-reviewed journal article.
3. Authors refer to secondary research and offer a meta-analysis.
4. This a short, and very difficult read. It’s the kind of literature that I expect to one day understand, and therefore, make a personal note to review this at such a time. As is, note it’s existence, in the chance that I happen to be working in the area, but I digress.

In the paper, the author deposits a philosophical claim, that in humanities quest in both deciphering and mastering nature, has inevitably become a quest in building machines that can simulate such systems. In this paper, the author discusses simulating natural phenomena using a particular manifestation of analog computing, which is claimed to exceed the performance of todays computer architectures (presumably referring to the “von neumann computer architecture”).

5. None given.
6. I plan to use such in my analysis of analog computing.

## Biological switches and clocks

Tyson, John & Albert, Reka & Goldbeter, Albert & Ruoff, Peter & Sible, Jill. (2008). Biological switches and clocks. *Journal of the Royal Society, Interface / the Royal Society*. 5 Suppl 1. S1-8. 10.1098/rsif.2008.0179.focus.

1. Tyson, John & Albert, Reka & Goldbeter, Albert & Ruoff, Peter & Sible, Jill.
2. Peer-reviewed journal article.
3. Authors refer to secondary research and offer a meta-analysis.
4. To my understanding, only 1.5% of your DNA encodes for proteins, while about 5% of your DNA are regulatory sequences.

The authors begin with a remark on the similarities between the information processing facilities of cells and that of manmade computers, and that, just as a “sophisticated theory of electronic circuitry” made modern manmade computers possible, so too, will a similar model of biomolecular circuitry give way to exploiting the regulatory mechanisms of cellular systems.

Later in, the authors discuss recent advancements from mathematical modelers in explaining such natural phenomena.

5. None given.
6. I plan to use such in my analysis of analog computing.