

## REFERENCES

- Brown, Elizabeth A., and David P. Müller. (1998). *The Age of the Earth*. Cambridge: Cambridge University Press.
- Damer, Brian W. (2016). "A Field Trip to the Archaean in Search of Darwin's Warm Little Pond." *Life* 6: 21.
- Damer, B. and D. Deamer. (2015). "Coupled Phases and Combinatorial Selection in Fluctuating Hydrothermal Pools: A Scenario to Guide Experimental Approaches to the Origin of Cellular Life." *Life* 5, no. 1: 872–887. <https://doi.org/10.3390/life5010872>.
- Dawkins, Richard. (1976). *The Selfish Gene*. Oxford, UK: Oxford University Press.
- Djokic, T., M. J. Van Kranendonk, K. A. Campbell, M. R. Walter, and C. R. Ward. (2017). "Earliest Signs of Life on Land Preserved in ca. 3.5 GA Hot Spring Deposits." *Nature Communications* 8: 15263.
- Dyson, Freeman. (1999). *The Origins of Life*. Cambridge, England: Cambridge University Press.
- Erdős, P. and Rényi, A. (1960). *On the Evolution of Random Graphs*. Hungary: Institute of Mathematics Hungarian Academy of Sciences Publication, 5.
- Farmer, J. D., S. A. Kauffman, and N. H. Packard. (1986). "Autocatalytic Replication of Polymers." *Physica D: Nonlinear Phenomena* 2: 50–67.
- Fernando, C., V. Vasas, M. Santos, S. Kauffman, and E. Szathmary (2012). "Spontaneous Formation and Evolution of Autocatalytic Sets within Compartments." *Biology Direct* 7: 1.

- Hordijk, W. and M. Steel. (2004). "Detecting Autocatalytic, Self-Sustaining Sets in Chemical Reaction Systems." *Journal of Theoretical Biology* 227: 451–461.
- Hordijk, W. and M. Steel. (2017). "Chasing the Tail: The Emergence of Autocatalytic Networks." *BioSystems* 152: 1–10.
- Jacob, Francois. (1977). "Evolution and Tinkering." *Science New Series* 196(4295): 1161–1166.
- Kauffman, S. A. (1971). "Cellular Homeostasis, Epigenesis, and Replication in Randomly Aggregated Macromolecular Systems." *Journal of Cybernetics* 1: 71–96.
- Kauffman, S. A. (1986). "Autocatalytic Sets of Proteins." *Journal of Theoretical Biology* 119: 1–24.
- Kauffman, Stuart. (1993). *The Origins of Order: Self-Organization and Selection in Evolution*. New York: Oxford University Press.
- Kauffman, Stuart. (2000). *Investigations*. New York: Oxford University Press.
- LaBean, Thomas. (1994). PhD thesis, University of Pennsylvania Department of Biochemistry and Biophysics.
- Lincoln, T. A. and G. F. Joyce. (2009). "Self-Sustained Replication of an RNA Enzyme." *Science* 323: 1229–1232.
- Longo, G. and M. Montévil. (2014). *Perspectives on Organisms: Biological Time, Symmetries and Singularities*. Berlin: Springer.
- Longo, G., M. Montévil, and S. Kauffman. (2012). "No Entailing Laws, But Enablement in the Evolution of the Biosphere." In *Proceedings of the 14th Annual Conference Companion on Genetic and Evolutionary Computation*, 1379–1392. See also <http://dl.acm.org/citation.cfm?id=2330163>.
- Loreto, V., V. Servedio, S. Strogatz, and F. Tria. (2016). "Dynamics on Expanding Spaces: Modeling the Emergence of Novelties." In *Creativity and Universality in Language, Lecture Notes in Morphogenesis*, edited by M. Degli Esosti et al. Basel, Switzerland: Springer International Publishing.
- Montévil, Maël and Matteo Mossio. (2015). "Biological Organisation as Closure of Constraints." *Journal of Theoretical Biology* 372: 179–191. <http://dx.doi.org/10.1016/j.jtbi.2015.02.029>
- Prigogine, Ilya and Gregoire Nicolis. (1977). *Self-Organization in Non-Equilibrium Systems*. New York: Wiley.
- Pross, Addy. (2012). *What Is Life? How Chemistry Becomes Biology*. Oxford, England: Oxford University Press.

- Rosen, Robert. (1991). *Life Itself*. New York: Columbia University Press.
- Schrödinger, Erwin. (1944). *What Is Life?: Mind and Matter?* Cambridge, England: Cambridge University Press.
- Segre, D., D. Ben-Eli, and D. Lancet. (2001). "Compositional Genomes: Prebiotic Information Transfer in Mutually Catalytic Noncovalent Assemblies." *Proceedings of the National Academy of Sciences USA* 97: 219–230.
- Serra, Roberto and Marco Villani. (2017). *Modelling Protocells: The Emergent Synchronization of Reproduction and Molecular Replication*. Dordrecht, The Netherlands: Springer.
- Snow, Charles Percy. (1959). *The Two Cultures*. London: Cambridge University Press.
- Sousa, F. L., W. Hordijk, M. Steel, and W. F. Martin. (2015). "Autocatalytic Sets in *E. coli* Metabolism." *Journal of Systems Chemistry* 6: 4.
- Vaidya, N., M. L. Madapat, I. A. Chen, R. Xulvi-Brunet, E. J. Hayden, and N. Lehman. (2012). "Spontaneous Network Formation Among Cooperative RNA Replicators." *Nature* 491: 72–77. doi 10.1038/nature11549.
- von Kiedrowski, G. (1986). "A Self-Replicating Hexadesoxynucleotide." *Angewandte Chemie International Edition in English* 25, no 10: 932–935.
- Wagner, N. and Gonen Ashkenasy. (2009). "Systems Chemistry: Logic Gates, Arithmetic Units, and Network Motifs in Small Networks." *Chemistry: A European Journal* 15, no. 7: 1765–1775.
- Weinberg, Stephen. (1992). *Dreams of a Final Theory*. New York, NY: Vintage Books.
- Woese, C. and G. Fox. (1977). "Phylogenetic Structure of the Prokaryotic Domain: The Primary Kingdoms." *Proceedings of the National Academy of Sciences USA* 74: 5088–5090.

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