

**NEGENTROPY: CONVERGENCE OF EVOLUTION, COGNITION, THE GENETIC CODE AND  
ORIGIN OF LIFE**

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**ABSTRACT**

Erwin Schrodinger in his 1943 *What is Life* identified “negative entropy” as the force that creates order from disorder in living things. I propose that negentropy is synonymous with cognition, which all living cells possess (Shapiro 2020) and is the unifying principle behind the genetic code, origin of life, evolution, and consciousness.

I propose a new framework by modeling the cell as a Volitional Turing Machine, analogous to Maxwell’s Demon. We can model the agency of the cell as a computer that can choose “1” or “0” before writing its next output. This choice is a non-deterministic action of a free agent with sensory capacity and memory. It is not computable from prior states. As well as reading and reacting to its environment, it anticipates future threats, chooses goals and reasons inductively. Computers do none of these things.

Negentropy is the reversal of information entropy, from uncertainty to certainty. A binary free choice of “1” or “0” creates one unit of Shannon information, just as noise erasing one bit of information constitutes one unit of information entropy. “Biological systems are the only known source of agency in the universe” (Cronin and Walker 2016) and information is an exclusive property of biology (Walker, Davies and Ellis 2017).

There is an asymmetry between entropy and negentropy because negentropy is teleological and entropy is not. I show that the following phenomena exceed the limits of computation and cannot be reduced to fixed laws but rather require negentropy: Computational choices, inductive reasoning, evolution, assigning meaning to symbols, harnessing stochasticity, axioms in mathematics, representation of scientific laws, measurement and perception, and negative information entropy. Thus the central question in both biology and computer science is: What is the nature and origin of cognition?

Keywords: negentropy, evolution, cognition, information entropy, origin of life, origin of information