

## **Astrobiology News February 2017: Will Computers Decipher the Origin of Life?**

In the 1950s, biochemists Stanley Miller and Harold Urey conducted a famous experiment that showed organic compounds could be formed by simulating the conditions of Earth's early atmosphere.<sup>1</sup> Since then, many scientists have explored questions relating to life's origins through laboratory experiments, but a recent approach uses cyberspace rather than the lab to investigate how biology may have arisen from geochemistry. *Computing the Origin of Life* discusses how *Computational biology* and *computational astrobiology* offer different approaches and additional tools for scientists researching how life may have arisen on Earth and possibly on alien worlds.<sup>2</sup>

One example of how computational biology is being used is through artificial life software called *Avida*.<sup>3</sup> *Avida* creates a virtual world in which programs compete for processing time and memory access similar to the way organisms compete for resources in the real world. The software is based on a controversial but potentially revolutionary idea that life can be defined as "information that self-replicates," and that selection of useful molecular systems for life is governed by the laws of probability. Understandably, this approach has its skeptics, but the idea is not to identify how life specifically originated and evolved on Earth, but rather to test general principles and then explore how those principles may operate in actual biochemical systems.

*Avida* could also provide a unique approach to exploring potential pathways to life on alien worlds, by investigating diverse processes that might operate on other planets with different environments and geochemistry. This is much easier said than done, of course! *Computing the Origin of Life* uses an analogy comparing the motions of a slinky with those of a snake to make the point that a pattern resembling life in a computer program doesn't necessarily represent the real deal. Nevertheless, as computing power increases, computational biology may offer new ways of thinking about life.

*Computing the Origin of Life* ends with the provocative statement, "The mystery of life's origins could one day be solved thanks to that modern antithesis of life – the computer." But is the computer really the "antithesis of life"? In the spirit of The Clergy Letter Project's commitment to deepening dialog between science and religion, I offer these thoughtful reflections of Antje Jackelén, the current Lutheran Archbishop of Uppsala in Sweden, who wrote, "[Furthermore,] the definition of life itself, in relation to its biological basis, should be open to reconsideration. We are already used to speaking of the life of nonbiological entities such as stories, books, and musical works. This could prepare the ground for an understanding of postbiological life as life."<sup>4</sup>

Until next month,

## Grace

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<sup>1</sup> <https://www.youtube.com/watch?v=NNijmxsKGbc>

<sup>2</sup> <https://astrobiology.nasa.gov/news/computing-the-origin-of-life/>

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<sup>3</sup> <https://www.ncbi.nlm.nih.gov/pubmed/15107231>

<sup>4</sup> Antje Jackelén 2002, *The Image of God as Techno Sapiens*, *Zygon*, Vol. 37, No. 2, pp.289-302